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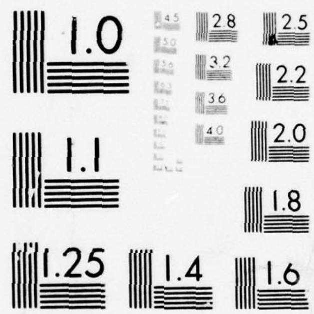

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A Special Study Report

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VETERINARY LABORATORY SERVICES STUDY - 1976

COL Robert J. Warne, VC, US Army
Chief, Veterinary Laboratory Service
Department of Pathology and Area Laboratory Services
Brooke Army Medical Center
Fort Sam Houston, Texas 78234

and

MAJ Tommy S. Armstrong, VC, US Army
Health Care Studies Division
Academy of Health Sciences, United States Army
Fort Sam Houston, Texas 78234

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Final Report

Prepared for:

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NOTICE

The findings in this report are not to be construed as an official Department of the Army position unless so designated by other authorized documents.

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This report covers the current operational aspects of CONUS and overseas veterinary laboratories that are providing direct support service. All laboratories were surveyed to obtain workload, sample, test, personnel and cost data. Study visits were made to the Health Services Command Laboratories in CONUS, but not to the overseas laboratories. The purpose of the study was to obtain information upon which to base planning and management of the veterinary laboratory system currently and near range. Results of the survey indicate that veterinary

20.
laboratories amalgamated with Medical Centers are well managed and providing services responsive to both the Medical Centers needs and the field veterinary requirements. Veterinary laboratories that are remote from their command and support elements (St Louis and Fort McPherson) are experiencing difficulty with management and administrative support requirements. The total workload, involving food analysis, diagnostic services and laboratory animal care has remained fairly constant although some functions such as radionuclides and pesticide survey work on environmental samples has decreased. Diagnostic services such as for rabies, equine infectious anemia and other zoonotic and animal diseases has actually increased or increase in this area is planned. Some special instruments, such as gas chromatographs, are underutilized because of limited requests for tests requiring their use, indicating that such equipment and functions should be centralized in two or three designated laboratories. All laboratories are well equipped and most instruments are used regularly. Workload and capacity studies indicate that four laboratories could effectively handle the current testing requirements for CONUS, if they could be provided sufficient personnel and some additional equipment.

SUMMARY

This study is a comprehensive review of the Veterinary Laboratory Services of the US Army Health Services Command and the major overseas veterinary laboratories. It was designed to provide current information for the planning and management of veterinary laboratory resources. Laboratory facilities, staffing, services, mission, equipment, technical management, and workload reporting were studied to determine the current status, identify needs, and project future requirements. New developments in subsistence testing over the past year, the realignment of the US Army Medical Laboratories under appropriate Medical Centers, the closure of the Defense Subsistence Testing Laboratory, Chicago, IL, with the assumption of a portion of its mission by the HSC laboratories, and the proposed transfer of certain veterinary teaching and diagnostic functions from the Walter Reed Army Institute of Research to HSC has prompted several questions that are the main focus of this study.

A study visit was made to each of the five HSC veterinary laboratories in CONUS to observe procedures, inspect facilities and equipment, and review workload or procedures. Specific data on workload, budget and facilities was obtained by survey questionnaires. Comments and suggestions were obtained from veterinary laboratory officers and other laboratory personnel. Operational data on all aspects of the veterinary laboratory operation was obtained which identified work output, resources utilized and other accomplishments.

Preface

This study is oriented towards US Army Health Services Command and overseas veterinary laboratories that are providing direct support to medical and veterinary activities. It is a review of current operations, management, workload and a variety of factors designed to provide information on present and future requirements. Major emphasis is given to the number and location of veterinary laboratories and the technical management system required. Staffing, training of veterinary laboratory officers, direct operating costs, facilities, equipment and projected wartime requirements are also considered. The applicability of the study is limited to near range planning and management of military veterinary laboratories.

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1. INTRODUCTION.

a. Purpose.

This study was conducted for the purpose of obtaining information to aid in the planning and management of veterinary resources. It deals primarily with the configuration of the veterinary laboratory service as it has changed over the past two years and as it now exists. The study proposal lists ten questions that constitute the main body of the study. In addition to these ten specific questions, the study is to determine the impact of the closure of the Defense Subsistence Testing Laboratory, Chicago, IL, on the HSC veterinary laboratories that assumed part of its mission on 1 July 1975. Another focal point of the study is to determine the desirability of transferring certain veterinary diagnostic and training functions from Walter Reed Army Institute of Research to the Health Services Command. Thus, the study comprises several questions on all aspects of the present veterinary laboratory service designed to determine the current functional status and provide an information base for future planning and actions. The specific questions which form the basis of the study are as follows:

(1) Since HSC established the locations of veterinary laboratories two years ago, has experience indicated a need for changing the number of locations in CONUS at this time? How many laboratories are required in overseas areas?

(2) Define the services to be provided by a complete veterinary laboratory as required by regulations and mission assignments.

(3) What staffing is required in each veterinary laboratory (Officer, enlisted, and civilian)?

(4) What training is required for officers and for enlisted personnel (Graduate, orientation, refresher, and on-the-job)?

(5) What equipment is needed in each laboratory? Is it all on hand?

(6) What manner of inter- and intra- laboratory technical management system is required in CONUS and overseas?

(7) What are the mobilization expansion and projected wartime requirements for veterinary laboratory service?

(8) Is an automated data processing system needed to provide a centralized recording system for laboratory results: Is a formal system (ADP), or other procedure needed to provide test data to HQ, HSC, DPSC, or research facilities?

(9) Are present CBR laboratory testing capabilities adequate to support mission requirements? Evaluate training, equipment, testing and reporting systems.

(10) Are current test and workload reports adequate for proper monitoring and management of veterinary laboratories by HSC? What additional data is required.

b. Background.

(1) Laboratory Realignment.

The Surgeon General appointed a task study group early in 1974 to evaluate the Army Medical Laboratories and furnish recommendations on the optimum system.[1] This group studied the laboratory system in some detail and on 19 April 1974 issued a memorandum with the following recommendations:

(a) Remove H & E resources from CONUS AML's, transfer mission and sufficient resources to USAEHA.

(b) Establish regional activities of USAEHA based on anticipated workload, transportation availability, suitable physical space and provision of responsive support to a geographical area.

(c) Establish at each CONUS MEDCEN and each regional activity of AEHA an epidemiology position MOS 3005/3006 with regional responsibility.

(d) Develop a realignment of veterinary medicine/subsistence testing support in consonance with (b) above and giving due consideration to sample transportation and personnel reductions.

Additional recommendations were made by the study group on personnel space reductions, changes to AR 40-441, and future study of TO&E laboratory support requirements in contingencies. The study group recommended that a plan be developed to implement the CONUS laboratory realignment early in 1975. This was done, and on 18 March 1975, Secretary of the Army, Howard H. Callaway, announced that the realignment/consolidation of the five CONUS-based US Army Medical Laboratories would take place on 30 June.[2] In essence, the realignment discontinued four of the CONUS-based US Army Medical Laboratories by amalgamation into nearby Medical Centers (3USAML, 2 USAML, 4USAML, 6USAML), closed the 5USAML in St Louis, and transferred environmental health and engineering activities to the US Army Environmental Hygiene Agency. The only exception to this action was the Veterinary Division of the St Louis Laboratory which remained in place and was assigned to the MEDDAC, Fort Leavenworth, KS,

for command and control. Plans were developed to obtain or construct a building for the St Louis Veterinary Laboratory at Fort Leavenworth and to move the laboratory there within one year.

(2) Defense Subsistence Testing Laboratory Closure.

On 22 January 1975, the Defense Supply Agency indicated that the Defense Subsistence Testing Laboratory in Chicago had been declared excess to the needs of the Department of Defense and would be closed on 30 June 1975. The DSTL had been in existence since World War II days at 1819 Pershing Road in Chicago, originally testing cereals, spices, jellies, sugar products and other non-animal origin subsistence. Based on a Hoover Commission recommendation in 1955, the Veterinary Division of the Fifth US Army Medical Laboratory, also located in Chicago, was combined/consolidated with the DSTL, or the US Army Quartermaster Subsistence Testing Laboratory as it was known at that time. Since 1955 the DSTL tested all types of subsistence items, including meat,dairy products and other animal-origin subsistence from Illinois and surrounding states, as well as all non-animal origin subsistence procured in CONUS. After the closure announcement, the Defense Supply Agency requested the Department of the Army to provide laboratory testing support for certain subsistence items as being in the best interest of the government.[3] In February 1975, it was agreed that the US Army Health Services Command would assume laboratory testing responsibilities for animal-origin products including meats, dairy products, and edible oils only.[4] The testing of non-animal products such as coffee, jelly, sugars, cereals, etc. was turned over to the US Department of Agriculture for production, acceptance, and verification testing. However, it was stated in the agreement that Army Medical Laboratories would test all government-owned products, including the non-animal subsistence items, for identification, evaluation, wholesomeness, safety and fitness for consumption. This closure and transfer action was carried out according to plans; the Defense Subsistence Testing Laboratory ceased testing operations in May and was finally closed on 30 June 1975.

(3) WRAIR Veterinary Laboratory Mission and Functions.

The Division of Veterinary Medicine at Walter Reed Army Institute of Research has had certain technical management responsibilities over the HSC Veterinary Laboratories. This is detailed in AR 40-920, Veterinary Laboratory Service, dated 29 May 1973 in which technical management responsibility was continued following the organization of the Health Services Command. This responsibility consisted of training veterinary laboratory officers, conducting annual inspections, conducting proficiency surveys, publishing technical data letters, providing some

reference service, and serving as consultant to the Surgeon General on matters relating to the veterinary laboratory service. In January 1976, the Walter Reed Army Institute of Research requested that "training and diagnostic functions" be transferred to Health Services Command.[5] This transfer of functions request specifically included two annual training courses for veterinary laboratory officers and all of the diagnostic service being provided such as rabies, toxoplasmosis, melioidosis, and leptospirosis. However, it is assumed that all of the technical management responsibilities over HSC laboratories now in AR 40-920 would be included in the transfer. Preliminary action had been taken by HSC during the past year to establish a veterinary reference and consulting laboratory at Brooke Army Medical Center, Fort Sam Houston, TX, to assume technical functions similar to those outlined in AR 40-920. The transfer of functions requested by WRAIR has not been completed at this time.

2. OBJECTIVE. The objective of this study is to obtain information on the present management, operation and status of the HSC and major overseas veterinary laboratories upon which to base immediate and near range planning. The following areas of laboratory operation are to be evaluated:

a. Veterinary laboratory locations and number required.

b. Laboratory services, staffing, and equipment required.

c. Training for officer and enlisted personnel.

d. Technical management, monitoring, and workload reporting.

e. Mobilization expansion, wartime requirements, and CBR capabilities.

f. Requirements for ADP system for test data reporting.

3. METHODOLOGY.

a. Overview.

The study approach was guided by requirements to review a broad area of veterinary laboratory operations in a rather limited time. Most of the study was centered directly on the five HSC CONUS-based and three overseas laboratories. Data on sample load, facilities, personnel and other aspects of laboratory functions was first obtained by mailing survey questionnaires to supervisory personnel of the laboratories. The study proposal was also sent to the senior Veterinary Corps officers in the laboratories and comments solicited on the study questions. Following these requests, personal visits were made to the CONUS laboratories, the Division of Veterinary Resources, WRAIR, and Health Services

Command. During the laboratory visits by the principal investigator, data obtained by the questionnaires was verified, facilities inspected, and discussions held with laboratory officials. The total data and information obtained during the visits was reviewed to provide findings for the many study questions. Particular concern was given to the total testing capacity of the CONUS laboratories. The interrelation of the study questions is considered in the final discussion and conclusion. The data on workload, procedures, tests, samples and equipment utilized was for a 12-month period, 1 April 1975 to 31 March 1976. Three months of this period was prior to the final realignment/consolidation of the medical laboratories and prior to the closure of the Defense Subsistence Testing Laboratory. Nine months of this period was after the realignment/consolidation and the DSTL closure. The 12-month period was selected to obtain the most accurate operational data under the current organization.

b. Procedures.

(1) Data Collection.

In April 1975, three different survey questionnaires were prepared and mailed to each laboratory with a request for detailed data for the 12-month period covered by the study. The study forms had the following headings:

(a) Sample and Specimen Data Sheet.

(b) Procedures and Test Data Sheet.

(c) Personnel, Space, Budget, and Equipment Data Sheet.

In addition, a letter was sent to the Veterinary Corps officer in charge of each laboratory with a copy of the study proposal requesting any suggestions or comments on the study questions. This was followed by telephone calls to each laboratory, further explaining the study. During this period, the related studies, files and reports at Health Services Command were reviewed and necessary data extracted.

A personal visit was made to each laboratory during May and June to inspect facilities and verify data furnished on the survey sheets. Dates and location of visits were as follows:

23-27 May 76	Fort McPherson, and DDEAMC, Fort Gordon, GA
15-17 Jun 76	Fort Baker and LAMC, Presidio of San Francisco, CA

20-22 Jun 76	Veterinary Laboratory Service Br., St Louis, MO
23-25 Jun 76	Fort Meade and WRAIR, Washington, DC

Personal visits were not made to the overseas laboratories. Offices in the BAMC laboratory at Fort Sam Houston were used for conducting the study and visits were made to HSC throughout the period.

(2) Total System Capacity Study:

(a) Given that the quantitative aspect of the CONUS HSC Veterinary Food Testing Laboratory system is a necessary, but not sufficient, criteria for determining the optimal number of HSC Veterinary Laboratories, this study will address the existing system relationships between workload and mission requirements using two basic criteria:

1. There is a positive, quantifiable probability associated with the likelihood that workload requirements will exceed the system's capacity.

2. There is a positive, quantifiable probability that each laboratory in the system will be unable to perform certain procedures at various points in time due to equipment failure or other unforeseen circumstances.

Both 1. and 2., above, translate directly into a positive probability that the system will either be unable to perform the required testing or that there will be a delay in returning test results to the submitting activity. It follows that an "optimal" system is one which keeps the probabilities of 1. or 2., above, within "reasonable" bounds and accomplishes this with a minimum essential system capacity.

(b) A precise evaluation of the limiting distribution for the numbers of samples the system's laboratories can analyze during a time period is, of course, dependent upon the independent and interaction effects of many variables. Consequently, a procedure-by-procedure and Lab-by-Lab evaluation of these relationships produces an unwieldy multivariate analytic model which does not lend itself to analysis within the time and resource constraints of this study. Therefore, the following "total system" approach was taken:

1. System workload (W) is expressed in total samples received.

2. System capacity (C) is expressed in maximum numbers of samples tested.

3. System reliability is expressed in terms of the ability to test samples and report results within normal time limits required by the various test procedures performed.

4. System operating procedures provide the option of rerouting samples to a second laboratory if the capacity of the primary laboratory is exceeded or if the primary laboratory is unable to perform the procedure for some other reason.

(c) The analytic model for evaluating the system capacity is constructed as follows:

1. Develop a probability of non-test (NT) or delay (D) statement for each laboratory based on historical data.

2. Combine the NT and D probabilities from each laboratory into a probability of NT or D statement for the system.

3. Select an "acceptable" probability (P) of NT or D level for the system. (i.e., want 90% or better assurance that the system will not experience an unacceptable level of NT or D during a given month.)

4. Determine existing sample capacities (C) for each lab and for the system.

5. Determine the level and distribution of actual workload data (A) for each lab and for the system.

6. Compute the required capacity (R) for achieving the probability level referred to in (3) above.

The overall model then is:

Minimize: $X = C-A$ (excess capacity)

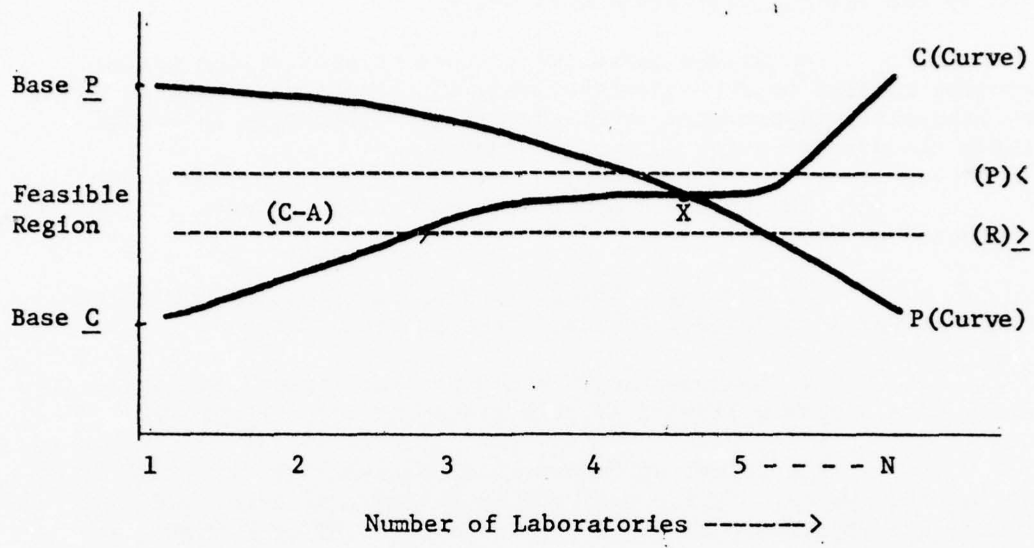
Subject to the constraints:

(1) Probability of (NT or D) is $\leq P$.

(2) $R \geq$ selected upper limit of the distribution of A.

(The 90th percentile in this example)

Graphically:



Where:

P(Curve) = diminishing probability of system failure as the number of labs increases.

C(Curve) = increasing system capacity as number of labs increases.

P = "acceptable" level of system reliability (minimum).

R = Required testing capacity levels (minimum).

(3) Data Analysis.

The data provided on the survey sheets and obtained during the laboratory visits was totaled and arranged in tabular form to show workload and all activities during the 12-month period. Actual utilization of personnel, equipment, and facilities is shown. Statistical tests were used to determine total laboratory capacity. Conclusions are based on data analysis, objective, and subjective criteria. Particular attention was given to the following specific categories:

(a) Total samples and specimens received and tested.

(b) Food samples tested in each class or group.

(c) Clinical or diagnostic specimens tested.

(d) Laboratory animal colony support provided.

(e) Specific procedures and tests accomplished.

(f) Personnel authorized and utilized in each work area.

(g) Total budget and direct operating costs.

(h) Facilities, floor space and arrangement.

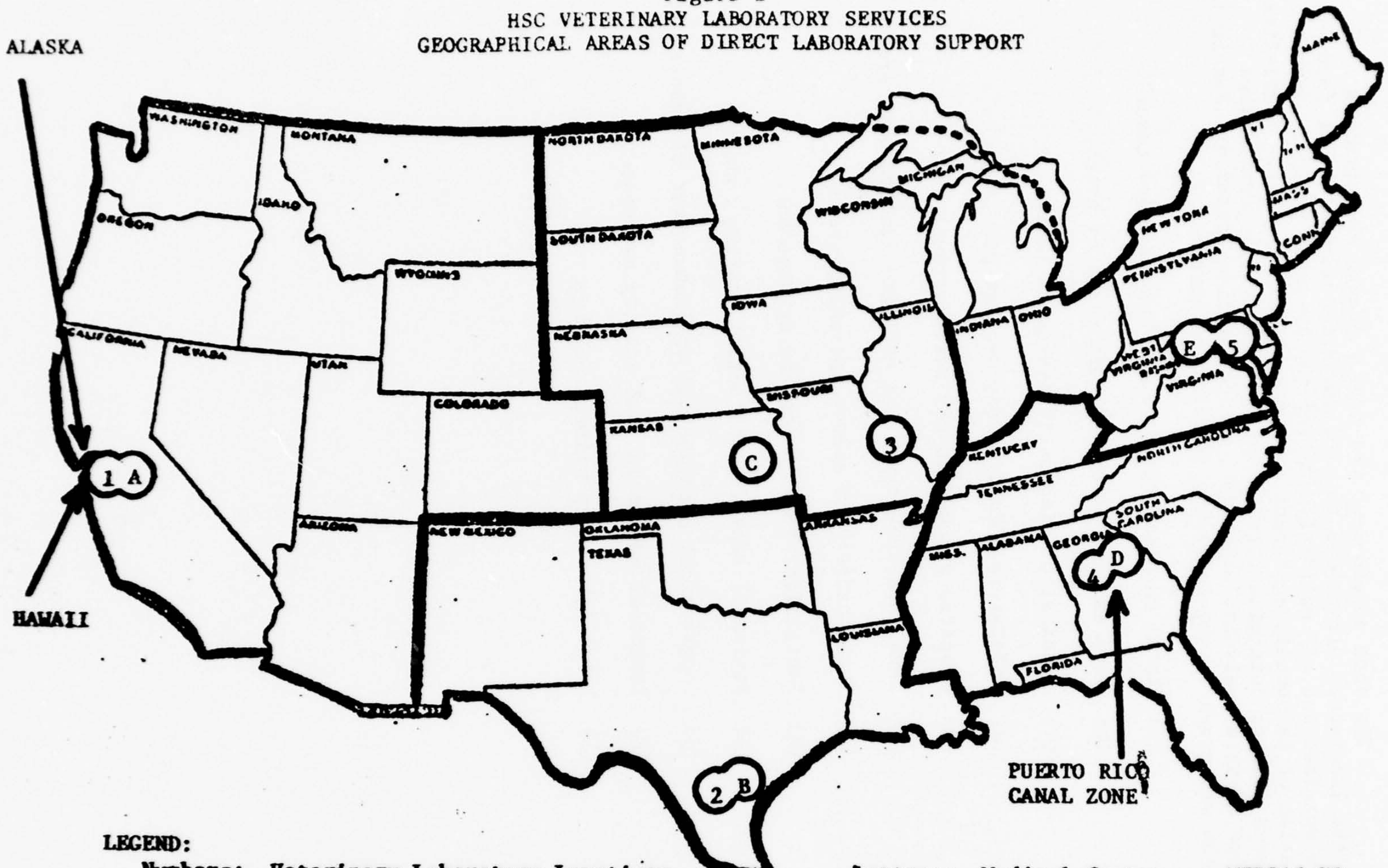
(i) Equipment capacity and actual testing capacity.

(j) Geographical location and optimum number of laboratories.

(k) Technical management and quality assurance.

(l) Total laboratory system capacity.

Figure 1
HSC VETERINARY LABORATORY SERVICES
GEOGRAPHICAL AREAS OF DIRECT LABORATORY SUPPORT



LEGEND:

Numbers: Veterinary Laboratory Locations

1 - Veterinary Medicine Section, Ft Baker, CA
2 - Veterinary Laboratory Division, FSH, TX
3 - Veterinary Laboratory Branch, St Louis, MO
4 - Veterinary Laboratory Division, Ft McPherson, GA
5 - Veterinary Laboratory Section, Ft Meade, MD

Letters: Medical Centers or MEDDAC HQ

A - LAMC, Presidio of San Francisco, CA
B - BAMC, FSH, TX
C - MEDDAC, Ft Leavenworth, KS
D - DDEAMC, Ft Gordon, GA
E - WRAIR, Washington, DC

4. FINDINGS.

a. <u>Veterinary Laboratory Status and Locations.</u>

(1) Fort Sam Houston, TX. The Veterinary Laboratory Division, now realigned with the Brooke Army Medical Center, has continued to function exceptionally well during the past two years. It is organized as a Division of the Department of Pathology and Area Laboratory Services, BAMC, and is located in the same facility (Bldg 2630) with the other main laboratory Divisions. This building is new and modern, well planned, with adequate space and room arrangements. Since the realignment/consolidation, the Veterinary Laboratory Division has been given 540 additional square feet of floor space. The testing workload in support of the five state geographical area has remained constant. Health Services Command has assigned BAMC several additional responsibilities during the past two years, including food reference laboratory functions, quality assurance manager of all HSC veterinary laboratories and consultant on veterinary laboratory services.

(2) Fort McPherson, GA. The Veterinary Laboratory Division, Fort McPherson, is a separate Division under the Department of Pathology, Dwight D. Eisenhower Army Medical Center, Fort Gordon, GA. All of the other laboratory functions, equipment and personnel formerly at Fort McPherson have now been transferred to Fort Gordon. The Veterinary Laboratory Division remains at Fort McPherson as an isolated veterinary laboratory unit, according to Health Services Command plans. The Veterinary Division is housed in the same two buildings it occupied prior to the realignment. Both are in very poor condition and in need of renovation and modernization. The animal colony and receiving functions are in an old temporary wooden structure requiring total reconstruction to make it acceptable. In spite of these poor current building conditions, the workload has remained constant and the quality of laboratory service has remained high, primarily due to the outstanding staff. The separation of the Veterinary Laboratory Division from DDEAMC has caused many problems of supervision and support. The primary reason for retaining the Veterinary Laboratory Division at Fort McPherson was transportation advantage offered by the Atlanta airport. Recent experience at DDEAMC and review of the public transportation service from throughout the southeastern United States to Augusta, GA, and Fort Gordon, indicate that veterinary samples and specimens can be transported there just as readily as to Fort McPherson.[6] The Commander, DDEAMC has determined that improved service and laboratory support could be provided if the Veterinary Laboratory Division was located at Fort Gordon, and has requested permission from Health Services Command to make this transfer and consolidate all DDEAMC laboratory services there.

(3) Fort Baker, CA. The Veterinary Medicine Section is now realigned under the Letterman Army Medical Center and is colocated at

Fort Baker with certain other laboratory functions that are called the Department of Pathology Reference Laboratory. It is situated in the same facilities it occupied prior to the laboratory realignment but has been assigned considerable additional space, some of which was formerly used by the laboratory health and environment activities. The buildings are old, temporary wooden structures, rather poorly arranged for the current veterinary laboratory requirements. Maintenance of the buildings is poor and the excess space creates problems of work flow and upkeep. The veterinary laboratory provides direct support to a nine state geographical area plus Alaska, and some Pacific areas. Most of the main administrative and support services are provided by the Letterman Army Medical Center at the Presidio of San Francisco, however, shipping and receiving is provided at Fort Baker. The veterinary laboratory has functioned well under LAMC and improved services to meet increasing requirements. An additional section for testing all of these products procured west of the Mississippi river. Informal plans are being developed to relocate all of the laboratory functions now at Fort Baker to the Presidio of San Francisco. This planned move would include the Veterinary Medicine Section and is contingent upon renovation of adequate space.

FIGURE 2

HSC VETERINARY LABORATORY FUNCTIONS AND RESPONSIBILITIES

MISSION/LABORATORY	BAMC	DDEAMC	LAMC	ST LOUIS	WRAMC
Animal Origin Foods All Testing except Fats	Yes	Yes	Yes	Yes	Yes
Shortening, Fats, & Oils	No	No	Yes	No	Yes
Routine Testing	Yes	Yes	Yes	Yes	Yes
Special Testing All Foods	Yes	*	*	*	*
Animal Colony	Yes	Yes	Yes	No	Yes
Rabies Diagnosis	Yes	Yes	Yes	No	Yes
EIA (Coggins Test)	Yes	Yes	Yes	No	No

*All samples originating with Army and Air Force Veterinary Service inspection personnel are sent to their direct support laboratory. BAMC also serves as the HSC reference laboratory for all food testing and is responsible for inter- and intra-laboratory control systems.

(4) St Louis, MO. The Veterinary Laboratory Service Branch is assigned to the US Army Medical Department Activity, Fort Leavenworth, KS, for command and control. Original plans to transfer the laboratory to Fort Leavenworth, KS, failed because space was not available at Fort Leavenworth and the request for urgent minor construction authority to construct a new laboratory building there was not approved. The Veterinary Laboratory Services Branch remains in the same location on the 7th floor of the Federal Building at 12th and Spruce Streets where it has been for many years. Much of the logistical support is provided through a memorandum of understanding with Fort Leonard Wood and by GSA. The MEDDAC Commander, Fort Leavenworth is unable to provide the proper command supervision over the laboratory because of the distance involved, and has requested that the Veterinary Laboratory Service Branch be transferred to Fort Leonard Wood. The laboratory facilities are in poor condition and need a major redesign and complete renovation.[7] The laboratory is performing food testing work in direct support of field food inspection activities over a nine state area of the upper Mississippi Valley. Plans are being made by AVISCOM, the major military tenant of the 12th and Spruce GSA Building, to move out. No firm information is available, but the future of the building is in question. Command and control of the laboratory has been inadequate, because of the distance involved. The disruption caused by the Fifth US Army Laboratory closure, planned move to Fort Leavenworth by the veterinary laboratory in its current location, and the uncertain future have created a very unsatisfactory situation.

(5) Fort Meade, MD. The Veterinary Medicine Service is organized as a part of the Medical Laboratory, Department of Pathology, Walter Reed Medical Center located in the building formerly occupied by US Army Medical Laboratory at Fort George G. Meade, MD. The facilities present an exceptionally well kept and unusually clean appearance. The entire laboratory is well arranged, neat and orderly with excellent work flow arrangements. Glassware washing and media preparation is efficiently handled by a central service. The Veterinary Medicine Service formerly did food analysis and maintained the laboratory animal colony, but now has assumed the rabies diagnostic service as part of the realignment/consolidation that took place a year ago. The Veterinary Medicine Service has established a complete shortening, fats, and edible oils testing laboratory as directed by Health Services Command, to test all of these products procured east of the Mississippi river. The main veterinary workload is direct support to medical and veterinary units in sixteen northeastern states. The veterinary laboratory functioned exceptionally well during the past year as part of the WRAMC organization. The entire laboratory reflects excellent veterinary and command supervision. The laboratory location is close enough to WRAMC that frequent personal contact can be maintained.

b. <u>Total HSC Veterinary Laboratory System Capacity</u>.

(1) Based on workload distributions for the 12-month period 1 April 1975 to 31 March 1976, and current testing capacities for the five CONUS Veterinary Food Testing Laboratories, the respective probabilities that workload requirements will exceed testing capacities are:

	P (exceeding C)
Fort Baker	.12
St Louis	.07
Fort Sam Houston	.04
Fort Meade	.01
Fort McPherson	.03

(2) The respective probabilities of non-test or delay due to reasons other than exceeding capacities are:

	P(NT or D)
Fort Baker	.040
St Louis	.036
Fort Sam Houston	.010
Fort Meade	.035
Fort McPherson	.036

(3) The system probabilities of exceeding capacity (At the .1 Level) as a function of system size are shown in the table below and are displayed graphically in Figures 3 and 4.

	P (exceeding C)
5 Labs	.04
4 Labs	.29
3 Labs	.73
2 Labs	.96
1 Lab	>.99

FIGURE 3

SYSTEM CAPACITY VS WORKLOAD REQUIREMENT
(BEST CASE)

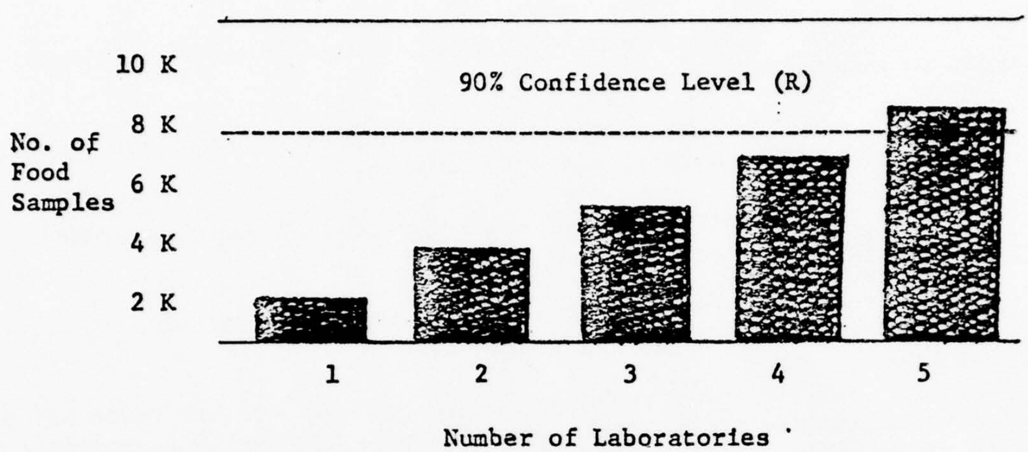
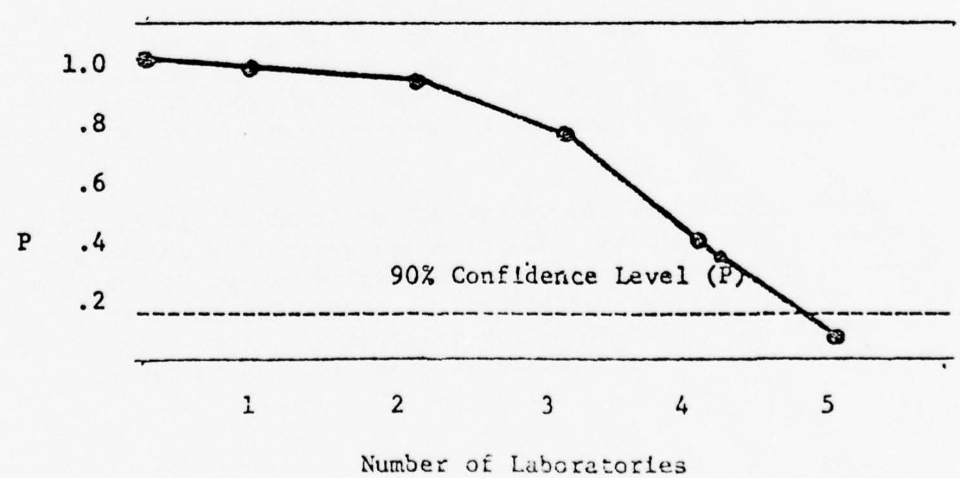


FIGURE 4

PROBABILITY OF EXCEEDING EXISTING SYSTEM CAPACITY



c. Veterinary Laboratory Services.

(1) The functions of a veterinary laboratory are listed in AR 40-920, Paragraph 4. They are broad in scope and include all possible aspects of laboratory operation. In outline form, the listed functions are:

(a) Conduct microbiological, chemical and radiological analysis of subsistence.

(b) Conduct diagnostic and consultant services pertaining to the zoonoses or diseases of military animals.

(c) Supervise care, housing, breeding and management of laboratory animals.

(d) Conduct technical inspections and proficiency surveys of locally approved dairy testing facilities.

(e) Provide technical advice to Army and Air Force major command veterinarians and furnish information on food testing, zoonosis control and significant sanitary defects or disease outbreaks that may be detected in the laboratory.

(f) Train personnel in veterinary laboratory procedures.

(g) Maintain liaison with other various laboratories to obtain technical information peculiar to the area.

(2) All of the veterinary laboratories surveyed were engaged nearly full time in subsistence testing work. Food analysis is the main activity of the laboratories if measured in terms of sample or test load. All of the veterinary laboratories provide technical advice to military staff and field veterinarians and maintain a close, communicative relationship with them. The veterinary laboratories maintain a good liaison with other laboratories in the area and exchange information and findings of mutual interest. No formal training in veterinary laboratory procedures is given, but all laboratories have informal on-the-job training for new personnel.

None of the laboratories performed any radionuclide isolation or detection work in food samples. All of the laboratories supervised animal colonies during the 12-month survey period except St Louis, however, St Louis did have an animal colony that was phased out prior to 1 April 1975. All of the laboratories performed some diagnostic work on human clinical specimens, mainly rabies serum neutralization, leptospirosis, human

chorionic gonadotrophin, urinary chorionic gonadotrophins, folic acid, and the T-3 thyroid function test. Four of the laboratories, all except St Louis, are performing rabies diagnostic service. Three of the laboratories (BAMC, LAMC, and DDEAMC) are performing the Coggin's test for equine infectious anemia. The Appendix Section of this report lists the kind and amount of direct laboratory services provided during the 12-month period.

d. Staffing of Veterinary Laboratories.

The current staffing of the five CONUS based veterinary laboratories is 84 required, 79 authorized and 72 assigned on 30 May 1976. A complete description of all positions and grades is tabulated in Appendix A. All CONUS veterinary laboratories are authorized two Veterinary Corps officers each, except St Louis which is authorized one, for a total of nine. A total of 24 enlisted personnel are authorized for four of the laboratories, DDEAMC has none authorized. Most of the enlisted personnel are the Medical Laboratory Specialist, MOS 92B, but five Food Inspection Specialists, MOS 91R, two Veterinary Technicians, MOS 91T, and one Clerk-Typist, MOS 71B are also authorized. Forty-nine civilian positions are authorized consisting of Chemists, Microbiologists, Medical Technologists, Medical Laboratory Technicians, Biological Laboratory Technicians, Physical Science Technicians, and administrative personnel. Figure 5 gives data on each laboratory.

FIGURE 5

SUMMARY OF HSC VETERINARY LABORATORY PERSONNEL REQUIRED, AUTHORIZED, ASSIGNED, AND UTILIZED DURING THE 12-MONTH PERIOD, 1 APRIL 1975 TO 31 MARCH 1976 (SEE APPENDIX A)

PERSONNEL/LAB	BAMC	DDEAMC	LAMC	ST LOUIS	WRAMC	TOTAL
Total Requirements	21	12	21	14	16	84
Total Authorized	19	12	19	13	16	79
Currently Assigned	14	12	18	15	13	72
Man Years for 12 months	14.0	12.0	16.5	13.0	11.5	67

Actual personnel utilization during the 12-month period surveyed was a total of 67.0 man years. These data are listed in Figure 3, which shows the actual man years each laboratory utilized in each major functional or objective area. A total of 27.7 man years was devoted to food chemistry, 16.4 to management, 11.9 to food microbiology, 6.1 to diagnostic services, and 4.9 to laboratory animal colony.

FIGURE 6

ACTUAL PERSONNEL UTILIZATION IN MAN YEARS AT HSC VETERINARY LABORATORIES DURING 12-MONTH PERIOD, 1 APRIL 1975 - 31 MARCH 1976

LABORATORY FUNCTION	BAMC	DDEAMC	LAMC	ST LOUIS	WRAMC	TOTAL
Management & Admin	2.6	3.3	3.0	4.5	3.0	16.4
Food Chemistry	7.0	3.0	7.5	6.2	4.0	27.7
Food Microbiology	2.6	2.5	2.5	2.3	2.0	11.9
Clinical Diagnostic	.9	2.2	1.5		1.5	6.1
Lab Animal Colony	.9	1.0	2.0		1.0	4.9
TOTAL	14.0	12.0	16.5	13.0	11.5	67.0

e. Officer and Enlisted Training.

Officer and Enlisted Training. Veterinary laboratory officers are selected for an interest or aptitude in laboratory science and are initially trained in the five weeks long Veterinary Laboratory Procedures course conducted annually at the Walter Reed Army Institute of Research. This course provides instruction on laboratory administration and considerable detailed training in animal disease diagnostic methods, food microbiology, and food chemistry. Enlisted personnel are trained in their specialty and are usually assigned to the veterinary laboratory without any other formal training. Both officer and enlisted personnel usually receive some informal on-the-job training upon initial assignment to the laboratory. Medical Laboratory Specialists, MOS 92B can normally be utilized with a minimum of orientation type training on-the-job, but the Food Inspection Specialist, MOS 91R, requires considerable training of this type in laboratory procedures. A refresher course, Current Trends in Veterinary Laboratory Procedures, is given annually by Walter Reed Army Institute of

Research. This course is for veterinary laboratory officers or other personnel that require some orientation training in laboratory work. Enlisted personnel are not given any special follow-up on training, except that associated with their MOS. Veterinary laboratory officers and occasionally enlisted personnel working in veterinary laboratories on a career basis are provided training at specialized courses given by the Center for Disease Control, Atlanta, GA, or by Federal Agencies or universities. These courses include topics such as rabies diagnosis, leptospirosis diagnosis, food chemistry, etc.

f. Laboratory Equipment.

Major items of laboratory equipment are listed in Appendix G. All laboratories have adequate standard equipment for performing the procedures commonly requested. All of the CONUS laboratories received some equipment by transfer from the Defense Subsistence Testing Laboratory when it closed on 1 July 1975, and the St Louis laboratory received some equipment from the Medical Laboratory there when it closed on the same date. Input of new and replacement equipment through the MEDCASE program has been regular, but most laboratories have equipment requests that have not been filled during the past two years because of limited funds. Most laboratories have experienced delays in testing or have been unable to do some specific test procedures because of equipment failure or shortage of equipment. Equipment status reported by each HSC laboratory is as follows:

(1) BAMC. Fire in Soxhlet room caused damage and equipment failure early in 1975. Samples for the soxhlet fat extraction test were forwarded to the St Louis Laboratory. The equipment was repaired and replaced with spark-proof items and testing resumed in May 1975. Test failures during the 12-month survey period due to lack of equipment were for crude fiber in dog food, vitamins in dog food and cocoa beverage powder, and pressed cake in canned tuna. Some equipment in other areas of the laboratory was shared, and on three occasions a chemist traveled to Kelly AFB to use special instruments there. No MEDCASE equipment is now on order, but approximately $5,000.00 worth of capital equipment consisting of a crude fiber apparatus, Carver press, fluorophotometer, spectrophotometer, and several standard replacement items are on purchase requests.

FIGURE 7

ESTIMATED MAXIMUM WEEKLY EQUIPMENT CAPACITY FOR KEY PROCEDURES, ASSUMING AVAILABLE SUPPLIES AND PERSONNEL

TEST PROCEDURES	BAMC	DDEAMC	LAMC	ST LOUIS	WRAMC	TOTAL
Fat, Roese-Gottlieb	560	1,000	400	300	300	2,560
Protein, Kjeldahl	180	120	180	180	120	780
Fat, Soxhlet	128	150	540	210	55	1,083
Moisture, Oven Method	500	>1,000	750	>1,000	45	3,295
Salt, Total Chlorides	250	500	480	300	25	1,555

(2) DDEAMC. Test requests for cocoa, pepper, shortening, margarine, and vinegar were not completed because of lack of equipment. In most cases, these samples were forwarded to another HSC laboratory that was equipped to perform the required testing. No major equipment failures were experienced during the year. Much of the standard equipment in the Fort McPherson laboratory is very old and plans are being made to replace it through the MEDCASE program and have it delivered to Fort Gordon in conjunction with the planned relocation of the veterinary laboratory to Fort Gordon. This equipment now on the MEDCASE program consists of an FA microscope, two refrigerators, fume hood, biological safety hood, water still, Kjeldahl apparatus, centrifuge, oven, analytical balance, glassware washer, sterilizer and incubator.

(3) LAMC. Delays of 13-68 days in completing testing on bouillon, civil defense water, soup, chili components, dehydrated meat products, shortening and edible fats were experienced due to equipment problems. The shortening testing equipment was obtained after HSC assigned this function to the Fort Baker Laboratory and there were delivery delays due to problems with the supplier. Difficulty in the replacement of repair of old equipment is reported. A new Kjeldahl apparatus is now on the MEDCASE list.

(4) St Louis. During December 1975 and January 1976 the exceptionally heavy sample load of Meals, Combat, Individual could not be tested without extensive delay, because of equipment limitations. Some of these samples were forwarded to Fort McPherson and Fort Sam Houston. The laboratory reports a need for replacement on a photofluorometer. No other items of capital equipment are needed and no items are on the MEDCASE list.

(5) WRAMC. Test failure on mustard was reported due to lack of equipment. No other significant problems were reported. Several items are now required, especially for the proper performance of the rabies diagnostic mission, including an FA microscope, refrigerator, two incubators, biological safety cabinet, centrifuge, freezer, analytical balance, flame photometer, infra-red spectrophotometer, vacuum oven, and calculator.

g. Laboratory Technical Management System.

The main technical management responsibilities for the HSC veterinary laboratories is assigned to the Walter Reed Army Institute of Research by AR 40-920. During the past year Health Services Command took preliminary action to assign technical management, consulting and quality assurance to Brooke Army Medical Center, Fort Sam Houston, TX. WRAIR has requested that their "diagnostic and training" function be transferred to Health Services Command. During the 12-month period studied, four food survey samples were sent by WRAIR and two survey samples by BAMC to all HSC laboratories for quality control purposes. WRAIR did conduct a Veterinary Laboratory Officers Training course in September 1975 and one Veterinary Corps officer from each laboratory attended the Symposium on Veterinary Medicine at WRAIR where a special half day session was held on laboratory problems. Central or inter laboratory technical management is now shared, to a degree, by WRAIR and BAMC. BAMC has a senior Veterinary Corps officer assigned to develop a technical management program there, but additional staff will be required to make it functional. Inter laboratory technical management is operated by the Chief of each laboratory and varies from informal to rather sophisticated. There is some variation in each laboratory on internal policies, sample control, quality control procedures and other technical management functions. All laboratories indicated a need for more quality control survey samples, and improved laboratory technical guidance.

h. Projected Wartime Requirements for Veterinary Laboratory Service.

Most of this study was directed to current operating parameters of the veterinary laboratory service and the immediate and near future requirements. Specific survey data was not obtained that would constitute a significant finding in this area. Veterinary laboratory officers were requested to furnish comments on the question of mobilization expansion and projected wartime requirements but general comments were the only response. The response most commonly given to the question was that testing of subsistence products at time of procurement would increase greatly, testing of government owned stocks of subsistence for identification and evaluation would decrease because of shortened storage times. Certain subsistence testing for wholesomeness, safety, and suitability for use may increase greatly. Laboratory diagnosis of zoonotic diseases and other animal diseases may increase greatly and be the

most serious problem.

i. Laboratory Results Reporting System.

(1) All CONUS veterinary laboratories report food analysis test results on the DD Form 1222, Request for and Results of Test. This form is specified by DPSC Subsistence Inspection Manual 4155.6 for use with all food samples and by H-57 for use with fresh dairy product samples. All sample data such as lot size, contract number, and source is listed on the top portion of the form by the veterinary inspector submitting the sample. Laboratory results or findings are entered on the bottom portion of the form. The total data pertaining to a specific sample are on the completed form. All laboratories retain a copy of DD Form 1222 with appropriate work sheets for file. Results are furnished to the Defense Personnel Support Center, Philadelphia, PA, Health Services Command, and veterinary inspection personnel by mail. Laboratory results are reported by telephone upon request or when laboratory findings are highly significant. Information copies of microbiological reports on foods other than fresh dairy products are furnished to the Chief, Food Hygiene Division, Letterman Army Institute of Research where they are computerized in a research effort to obtain a data bank in this area.

(2) Clinical and diagnostic specimens are received with the SF and this form is used to report laboratory results of most specimens. The rabies diagnostic specimens are submitted to each laboratory on a special locally produced form which provides considerable data on the animal, human exposure involved and other history. All rabies specimens are examined expeditiously and findings immediately reported by telephone with follow-up written reports. Equine infectious anemia testing of equine sera is reported on an official USDA Form with copies sent to Federal veterinary regulatory authorities.

(3) All laboratories maintain accession or log-in records for each sample or specimen and retain file copies of request forms and appropriate work sheets. Reports of laboratory results are usually reported out within 7 to 10 days, with 14 days being the maximum time required, except on rabies confirmation and some special chemistry work. Copies of food analysis reports received by Health Services Command are forwarded to the Chief, Veterinary Laboratory Division, BAMC, for technical review. No summary of laboratory data is maintained. Clinical and diagnostic reports are usually sent by the laboratory concerned to the submitting activity and no further distribution is made. The Programs Section, Technical and Quality Assurance Division, Defense Personnel Support Center maintains certain laboratory data to determine contractor reliability. The only centralized data bank of laboratory findings is that at Letterman Army Institute of Research on microbiological results.

j. CBR Capabilities of Veterinary Laboratories.

(1) None of the CONUS veterinary laboratories have radioisotope

detection equipment on hand. Radioisotope detection instrumentation for use in low level environmental and food samples has been disposed of by transfer to the US Army Environmental Hygiene Agency activities or through other property disposal channels. The Medical Center Laboratories do have instruments for clinical radioisotope tests such as the T-3 thyroid function test and radioimmune assays, but this equipment is generally not suited or available for other use.

(2) During the 12-month survey period there was no radioisotope detection work performed by veterinary laboratories on food samples. There was some clinical radioisotope work done by veterinary personnel consisting of radioimmune assays for folic acid, vitamin B-12, human chorionic gonadotrophin and the T-3 thyroid function test.

(3) Veterinary laboratory officers receive several hours of instruction on radiocontaminants of food in the WRAIR laboratory procedures course, and the chemists and senior technicians in the veterinary laboratories have had training and experience in radioisotope detection work. In the past years, food radioisotope detection work was conducted by the veterinary laboratories, but was gradually phased down and then finally eliminated, for all practical purposes, by the realignment/consolidation of 1975.

k. Laboratory Test and Workload Reports.

All of the veterinary laboratories furnish data for the work unit report required by AR 40-24. This report is sent to SGO but is not received and used directly by Health Services Command for monitoring of the laboratories. All food analysis reports, DD Form 1222, are received by Health Services Command and are used primarily for monitoring field food inspection activities; however, they are used to some extent for monitoring laboratory operations. Diagnostic and clinical laboratory reports are not received by Health Services Command, but are sent directly back to the requesting veterinary or medical activity. Unusual findings or significant animal disease problems, such as positive animal rabies cases, are reported by telephone to HSC. The MED 302 Report required by HSC Supplement 1 to AR 40-418 is for comptroller use. While data for veterinary laboratory operation is included in this report it is not listed separately unless the laboratory has a separate unit identity code. Consultants trip reports, IG reports, and informal reports from veterinary personnel in the laboratories are used for management. Data for past management actions has been obtained from each veterinary laboratory when needed. The other sections of the Medical Center laboratories, except veterinary, are now following a CAP system of reporting work procedures. This CAP system does not include the food analysis procedures most commonly done in the veterinary laboratories. The veterinary portion of the report required by AR 40-24 is confusing to veterinary

personnel, is an incomplete adaption of the CAP system, and does not provide a concise work unit report because of different interpretation by different laboratories. Regular workload report data is not received by HSC.

1. Overseas Veterinary Laboratories. Survey questionnaires were received from three overseas laboratories, but on-site inspections were not conducted. Each overseas laboratory is different in organization and function to some extent; this being influenced by the local command requirements. Only general findings are reported here. Workload and other data on the overseas laboratories is in Appendix O.

(1) 10th USAML, Europe. The veterinary laboratory is performing food analysis in support of the food inspection and procurement activities in Europe. The veterinary staff consists of two Veterinary Corps officers, nine enlisted and five civilians. Some food radionuclide work is reported and the laboratory has a Beta counter on its property list. During the 12-month study period, the laboratory could not test 366 meat and dairy samples because of inadequate fume disposal, or equipment failure. Difficulty in obtaining service and repair for the ether extraction room fume disposal system is reported. Rabies diagnostic service is provided using the FA technique and mouse innoculation for conformation. The veterinary personnel performed radioimmune assay tests for FSH and LH, but these functions were transferred to the Department of Chemistry in October 1975. A sheep flock is maintained and sheep blood is supplied to clinical laboratories in Europe for use in their diagnostic services. The veterinary laboratory provides training of food inspectors assigned to dairy plants supplying the US Forces and inspects the field quality control laboratories.

(2) USAML, Pacific. The laboratory has one Veterinary Corps officer, two enlisted, and seven civilians assigned. The Veterinary Corps officer also has other duties outside of the laboratory in the Veterinary Activity. The laboratory has unfunded plans to relocate and modernize the ether extraction room. The laboratory does rabies examination by the FA technique, but Japan is now rabies-free and the Government of Japan does not permit rabies specimens to be shipped into the country. Therefore, the laboratory cannot provide rabies diagnostic service for Korea or other Pacific areas. The laboratory workload has decreased considerably over the past few years, especially since 1972. The relatively small food sample load, wide dispersion of supported units in the Pacific, and the rabies diagnostic problem are causing a reappraisal of the laboratory. Reduction of R&D funds have decreased the laboratory animal colony support requirement. The laboratory is scheduled for transfer to the Department of the Navy under PBD-253 not later than 31 December 1976. A review of veterinary laboratory requirements in Japan and the Pacific is needed at this time, so that adequate support can be continued.

(3) USAML, Hawaii. The food testing section of the Medical Laboratory at Schofield Barracks functions with part-time assistance from a Veterinary Corps officer and one or two other laboratory personnel. All of the testing work performed by the laboratory is food analysis. Most of the samples are fresh dairy products, fresh meats and frozen-in-flight meals from Hawaii.

5. DISCUSSION.

a. Location and status of CONUS veterinary laboratories. The veterinary laboratories were not physically moved during the US Army Medical Laboratory realignment/consolidation process. They remained in the same location during the change and still remain today in the same building and facilities they occupied for several years. Many other dramatic changes were made in the total medical laboratory organization and structure, so even though the veterinary laboratory elements did not actually move, they faced considerable change and turbulence. Four of the veterinary laboratories were amalgamated with the Departments of Pathology at Medical Centers, which are almost totally dedicated to the direct clinical laboratory support of patients. However, the Medical Centers have excellent laboratory organizations that provide exceptionally fine command and administrative support of the veterinary elements. This consolidation of veterinary laboratories with the four Medical Centers seem to be an ideal arrangement for all concerned, and should improve as time goes on. The move of the St Louis Veterinary Laboratory to Fort Leavenworth did not go according to Health Services Command plan. When the main medical laboratory closed, veterinary personnel and equipment were made ready for the move, but it never occurred. This delay and uncertainty complicated by difficult internal management and command problems have been very detrimental to the laboratory operation. These problems still exist at the St Louis laboratory. The veterinary laboratory at Brooke Army Medical Center experienced the least change. All laboratory functions remained consolidated at Fort Sam Houston, TX, and the realignment was just an administrative transfer.

(1) The veterinary laboratory at Fort Meade remained in position, but many of the other laboratory functions are being moved to the main Walter Reed Army Medical Center in Washington, DC. The final configuration of WRAMC laboratories has not been determined, pending completion of construction now underway, but it seems certain that the veterinary laboratory functions will remain as located. The facility at Fort Meade is in excellent condition and is close enough to the main Walter Reed Army Medical Center that proper command and administrative support can be provided. In many ways the two veterinary laboratories at BAMC and WRAMC are in similar situations. Both are in excellent, permanent, well arranged facilities and have proper support.

(2) The veterinary laboratory at Fort Baker, CA, is in old buildings that create several problems with workflow and upkeep. This situation is recognized and Letterman Army Medical Center is making plans to relocate the veterinary laboratory and certain other laboratory functions to renovated buildings on the Presidio of San Francisco. Internal management, command and support of this veterinary laboratory is excellent and the planned move to the Presidio will assure continued excellent support. The veterinary laboratory at Fort McPherson has experienced several problems with support since all of the other elements moved to Fort Gordon, GA. It is somewhat similar to the St Louis Laboratory in this respect. Command is remote, logistical support is by other organization, the building and facilities need renovation, and personnel are isolated from other laboratory scientists. It has not proved to be economical or practical to operate as a separate remote unit and the Commander, DDEAMC has taken positive action to move it to Fort Gordon.

(3) Apparently the main reason for leaving the two veterinary laboratories at St Louis and Fort McPherson was to retain them in transportation centers where food samples could be quickly received. Transportation service is an important matter, since most of the veterinary specimens are received by mail or air freight. However, in the concern for proper transportation access, the requirements for support and many other associated factors may have been overlooked. Test shipments from throughout the southeastern United States were received by the DDEAMC at Fort Gordon, GA, within the same time frame that identical samples were received at Fort McPherson in Atlanta, GA. Several air flights a day from Atlanta to Augusta, GA, and other direct airline service as well as bus service into Augusta provide excellent, reliable transportation service to Fort Gordon. Because of delays in the air freight handling system at the Atlanta airport and ground traffic congestion in Atlanta, some observers feel that samples can really be delivered more expeditiously to DDEAMC at Fort Gordon than they can to Fort McPherson. The action now underway to relocate the veterinary laboratory at Fort McPherson by the DDEAMC should provide total resolution of the command and support problems. A simple solution to the problems facing the St Louis Veterinary Laboratory are not so readily discernable. In establishing the location of veterinary laboratories no easy or universal formula can be found. It appears, however, that it is not practical to allow single, isolated laboratories to remain at locations remote from their command, and other professional elements. To do this seems contrary to the entire medical laboratory realignment/consolidation philosophy and modern concepts of total laboratory operation.

(4) Efficient and effective laboratory service operation today requires the bringing together of many professional disciplines to assist and reinforce one another and to share common space, supply rooms, equipment, animal facilities, libraries, shipping and receiving

support, mail rooms, clerical assistant, and a host of other important things. Veterinary laboratories can be assisted considerably by the laboratory scientists available in Medical Center laboratories, such as pathologists, microbiologists, mycologists, toxicologists, parasitologists, and others. By the same token, the veterinary laboratory personnel can provide assistance with the zoonoses, animal diseases, nutritional studies, food wholesomeness problems, and laboratory animal care. In the larger central laboratory, personnel can be readily shifted to meet changing workload demands, in case of leaves or absences temporary assistance can be provided, night and weekend duty personnel provide around-the-clock observation and emergency service, equipment can be shared or easily borrowed in case of need and many other advantages can be listed.

(5) Based on observations made in this study and experiences with the St Louis and Fort McPherson veterinary laboratories during the past year, it seems rather clear that the small, isolated laboratory cannot provide an effective, complete or efficient service. Technical management, administration, command, and proper support is difficult, or even impossible to properly maintain. The veterinary laboratory should be totally aligned with and physically part of the laboratory service of a Medical Center.

b. <u>Total HSC Veterinary Laboratory System Capacity</u>.

(1) The current HSC Veterinary Laboratory System provides sufficient capacity to insure (with >95% confidence) that the monthly workload requirements will not exceed the combined (five laboratory) system capacity.

(2) Reducing the system to four laboratories (by eliminating the laboratory at Fort Baker or Fort Meade or St Louis) would reduce the system confidence Level to approximately 71%. However, by increasing the capacity of each remaining laboratory by 200 samples per month, the system confidence Level returns to 90%.

(3) The probability of non-test or delay due to reasons other than exceeding capacities can all be rounded off to approximately .04 with the exception of Fort Sam Houston which had only .01. Thus, the five laboratory system provides a very high level of reliability which is diminished only slightly by reducing the number of laboratories to four.

c. <u>Laboratory Services</u>.

(1) The veterinary laboratory services to be provided are quite well listed in the regulation AR 40-920. From a practical standpoint, there is some limit to the actual variety of tests and procedures that can be done on any substantive basis. The problem then, is defining

the requirements and priorities and offering those tests or services that are regularly required. Essentially, this should be standard food chemistry and microbiology tests, tests to determine wholesomeness, diagnostic tests involving animal diseases or zoonoses, laboratory animal colony service and the other advisory and consultant services. In the past years the veterinary laboratories were involved to a considerable extent in the screening of foods for pesticides, radionuclides, antibiotics, and other illegal and hazardous substances. This work was encouraged under the old US Army Medical Laboratory system and it did provide much valuable information. However, most of these programs were regional, generated to a large extent by the laboratory and were not sustained. Some important food additive work is now being done, but the screening of food samples for environmental levels of contaminants has been practically discontinued.

(2) The request for special diagnostic procedures such as toxoplasmosis, trichinosis, or for other clinical chemistry procedures is occasionally presented to the laboratory. All of these specialized procedures cannot be economically done by the veterinary section. In the Medical Center laboratory several specialized sections exist that can provide service in these areas.

(3) When these specialized procedures are required for government-owned animals or zoonosis control clinics, it is logical that they be done by a single section for reasons of improved management and economy. Essentially then, diagnostic and special procedures that are occasionally requested by field veterinary activities, should be done in the veterinary section or in collaboration with other sections.

(4) The veterinary laboratories are doing some work on human clinical specimens. This depends upon local command decision and other factors, but includes radioimmune assay procedures, nitrogen in body fluids and other tests listed in Appendix D. The veterinary laboratory is underutilized in the clinical and diagnostic areas, in most cases. The DDEAMC laboratory at Fort McPherson is an exception; since several diagnostic procedures involving zoonotic diseases are done there. Their diagnostic service could be considered a prototype for other Medical Center commanders to consider. The veterinary laboratories now in the Medical Centers are in an excellent situation, and have the ability to provide increased service in this area.

(5) The use of laboratory animals has decreased in medical diagnostic laboratories over the past few years. Many tests, such as human pregnancy testing, *Mycobacterium tuberculosis* isolation and others have been converted to in-vitro procedures. Sheep flocks for the supply of fresh blood have disappeared from CONUS laboratories and blood agar plates and other blood products are obtained from commercial

sources. Some laboratory animals, especially small rodents, are still used for rabies diagnosis, rabies serum neutralization, some special virus studies and mycology. Other small laboratory animals are occasionally used for special studies. Where possible, the combination of all Medical Center laboratory animal functions may improve management and economy. Each Medical Center should review their own particular situation in this regard. The main services of all of the veterinary laboratories are food analysis work. This comprises over 90% of the actual sample or procedure load.

d. Staffing of Veterinary Laboratories.

(1) The present staffing of the five CONUS veterinary laboratories is 9 Veterinary Corps officers, 22 enlisted personnel and 49 civilians. The number and percentage of civilian positions has increased over the past two years as some enlisted positions were civilianized. The Defense Subsistence Testing Laboratory closure in Chicago caused five additional civilian positions to be added, and the special mission assigned to BAMC by HSC has increased the civilian personnel authorization there by three persons.

(2) The veterinary laboratories have about the same food testing workload requirement, but there is considerable variation in the staffing. The actual geographic area supported by the individual laboratories was regulated by HSC so that the workload would be fairly equivalent. There is some difference in sample mix and other functions, such as animal colony and diagnostic service, but the total workload of each laboratory is remarkably similar. Two of the laboratories, Fort McPherson and St Louis, have additional support personnel because they must provide for much of their own service in this area. Fort Baker and Fort Meade have special shortening, fats, and oils testing which requires some additional staffing, and BAMC has the additional functions assigned by HSC.

(3) DDEAMC, Fort McPherson, has no enlisted military positions, and St Louis has only two. These two laboratories rely basically on a civilian staff for the testing work. The other three laboratories, BAMC, LAMC, and WRAMC, have several enlisted personnel and use them in several areas of the laboratory. DDEAMC has a very stable civilian staff, but no chemist; although they have a medical technologist with equivalent experience and training.

(4) The other four laboratories have three chemists each. Only two of the laboratories, St Louis and LAMC, have microbiologists authorized and assigned, however, BAMC and WRAMC are in the process of obtaining microbiologists. In the past, much of the microbiology work has been done by technicians under the supervision of a Veterinary Corps officer or chemist. The shortage of Medical Laboratory Specialists, MOS 92B, is shared by the veterinary laboratories. Unfilled vacancies

exist at all laboratories that have authorized 92B positions. In addition, the veterinary laboratories generally receive a slightly lower priority for these personnel. When available, the 92B specialists have shown exceptional ability in the veterinary laboratory and can readily perform diagnostic, food chemistry, and food microbiology tests with a minimum of orientation training.

(5) Several Food Inspection specialists, MOS 91R, are assigned to veterinary laboratories. These personnel are well trained in food inspection procedures, but are not given any special training in laboratory methods. They are well motivated and very productive in the laboratory after some on-the-job training, but they are out of their career field which causes problems with proficiency tests and promotion. The 91R personnel have been assigned primarily because of the 92B shortage, but are not a permanent solution to the veterinary laboratory staffing problem. Good 91R personnel with experience usually do not prefer a laboratory assignment and several vacancies exist.

(6) The Veterinary Technician, MOS 91T is used in two of the laboratories for animal care; two of the laboratories use civilian animal caretakers. Laboratory animal colonies are now so small that a full time caretaker is unnecessary and these personnel must perform duties in another area of the laboratory. Most small rodent colonies and miscellaneous animals now being maintained by most laboratories would require about four hours per day.

(7) Most of the veterinary laboratories are now heavy civilianized. The requirement for special skills in food chemistry and animal disease diagnosis plus the continuing shortage of 92B enlisted personnel indicate that key positions should be civilianized. Each laboratory should have at least one graduate microbiologist directly assigned. In addition to the heavy food microbiology workload, there are diagnostic procedures and other duties in the field of microbiology. Each laboratory should have sufficient chemists to provide proper supervision and perform required bench work in this major workload area. Sufficient technicians with laboratory skills in chemistry, microbiology, and diagnostic procedures should be available as necessary. Two Veterinary Corps officers should be assigned to each complete veterinary laboratory.

e. Officer and Enlisted Training.

(1) The veterinarian is well schooled in the basic laboratory sciences during undergraduate training, but does need some orientation type training prior to assignment in a military veterinary laboratory. Many veterinarians have had only a minimum of experience in actual laboratory work, especially that involving food analysis. A short training course of four or five weeks is almost manditory for proper job orientation. Usually it is assumed that the new veterinary laboratory officer will then be assigned to a laboratory where on-the-job training can be provided for a short period of time by an experienced veterinarian.

(2) This training, provided in the past at the Walter Reed Army Institute of Research, has been very valuable. The request by WRAIR to transfer this training to HSC where it can then be assigned to the Academy of Health Sciences and BAMC seems reasonable.[5] The veterinary laboratory at BAMC is not staffed or equipped at the present time to conduct this type of training, but could do so if adequate resources were provided. Probably the best resolution would be for AHS and BAMC to participate jointly in conducting the training with student administration and certain basic instruction being done by AHS and practical veterinary laboratory training being given by BAMC.

(3) The current trends in Veterinary Laboratory Procedures has been scheduled for annual presentation by WRAIR, but is canceled ocassionally if subject matter is not sufficient. It is a valuable course for those older veterinary laboratory officers that are pursuing a career in the field. Perhaps one every two years would be adequate for this course. Since many of the speakers and contributors to this course have come from the other Federal agencies in the Washington, DC area, it may be best to continue having this course in the Washington area.

(4) Course location for this refresher type course is not critical and another consideration would be to rotate the course around the Medical Centers where the veterinary laboratories are located. Specialized civilian courses given at the Center for Disease Control, Atlanta, GA, and in other various universities and agencies should be a part of the laboratory veterinarians training. Many of these courses deal directly with diagnostic procedures and other laboratory matters. Officers that are to continue in the laboratory field should be provided long term civilian training at the graduate level in a specialty such as biochemistry, virology, microbiology, public health, or food technology.

(5) Enlisted personnel, especially the Medical Laboratory Specialist, MOS 92B, brings many utilizable talents to the veterinary laboratory. Those that have had prior assignment in laboratories and worked in chemistry, microbiology, or diagnostic areas can be directly utilized with little additional orientation. They should be encouraged to maintain proficiency in all aspects of their MOS and to attend all training that is available.

(6) The actual number of military enlisted personnel now in laboratories is decreasing and this trend appears to be continuing. A majority of the veterinary laboratory work force is civilian. Continuing education programs should be encouraged, especially for key supervisory personnel or those aspiring to leadership positions. Training in management, statistics, rabies diagnosis, special food microbiology and other areas in which the employee is involved should be provided. Training in microanalytical detection, and foreign material identification is needed.

Additional areas of training should be identified by each laboratory. Many employees need refresher type training to be brought up-to-date in their particular field. Veterinary laboratory personnel usually make up about 7% of the some 200 or more laboratory staff in a Medical Center, and have limited cross professional contacts in the field of food chemistry and food technology. Personnel should be encouraged to participate in the meetings and training activities of professional associations and groups. Attendance at special short term training courses, such as those given at the Center for Disease Control, The Association of Official Analytical Chemists and elsewhere should be required for supervisory personnel annually and be funded by the Medical Center.

f. <u>Laboratory Equipment</u>.

(1) The veterinary laboratories have been operational over a period of many years and have added new and replacement equipment as needed. In some cases, MEDCASE priorities and delays have caused old equipment to be used longer than recommended, but the laboratories are basically well equipped. Transfer of equipment from the Defense Subsistence Testing Laboratory in Chicago to the HSC veterinary laboratories has been very helpful. Some complaints concerning medical maintenance were reported, but these were usually isolated cases involving special instruments or circumstances. The veterinary food testing equipment is mostly non-standard and proper maintenance and repair is sometimes a problem.

(2) The veterinary laboratories have some excess equipment in certain categories. Stated in another way, veterinary laboratories have items of equipment that are used very little. One of the management problems with veterinary laboratories is that a wide variety of tests and procedures are performed, many of which are only requested ocassionally. A majority of the tests are requested and performed regularly, but some ten to twenty percent are in the ocassional, or less than one per week category. For simple tests that require little preparation or equipment, this usually presents no problem, but for specialized tests requiring extra equipment or instruments it can be an expensive problem. Health Services Command has already centralized the testing of shortening, fats, and edible oils in two laboratories (WRAMC and LAMC), and designated BAMC as the special laboratory for reference and quality control. Additional centralization is necessary for economic utilization of specialized equipment and personnel in the testing for pesticides, heavy metals, vitamins and certain other procedures.

(3) In the transfer of equipment that took place during the total realignment/consolidation process, the veterinary laboratories obtained certain items of equipment that have not been utilized to any extent. Recently, equipment from Chicago was was being held at Fort

Leavenworth was transferred to BAMC, Fort Sam Houston, TX, and other transfers of equipment to where it is needed are still underway. The total and individual mission of the HSC veterinary laboratories was not entirely clear at the time of some of the realignment actions and equipment was transferred at that time based upon the best judgment available Physical placement of installation or equipment has presented a problem in some cases where laboratories are in old, poorly arranged buildings. During the next year as the realignment/consolidation process is finalized, laboratories at Fort Baker, St Louis, and Fort McPherson may be moving or renovating. In either case, there is a critical need to reevaluate all equipment utilization and to place all major items of equipment properly to maximize work flow and safety. Central management is needed at the Health Services Command level to assure that all equipment required is proper installed, but that excess or underutilized equipment is eliminated. This in turn requires a basic list of procedures or services to be performed by each individual laboratory.

(4) Figure 7 lists the maximum weekly equipment capacity for certain specified test procedures. In general, most tests can be performed in considerable numbers if personnel are available. The main tests now done regularly, that are limited by equipment size are the Soxhlet fat extraction and the Kjeldahl protein procedure. Even in these, the current laboratory system equipment capacity exceeds the current output by a considerable margin. If the maximum weekly capacity for these two procedures is multiplied by approximately 50, the annual capacity for Kjeldahl protein is 39,000 single tests and for the Soxhlet fat extraction is about 50,000 single tests. The total number of Kjeldahl protein tests done during the 12-month study period was 2,063 and Soxhlet fat extractions was 18,666. In case of contingencies or mobilization, the food analysis output could be quickly increased to double or triple the present level by increasing the number of personnel.

(5) Even though equipment capacity is adequate, there are occasional delays caused by breakdowns, and heavy workload peaks. Delays were caused during the study period by failure of shortening testing equipment, Soxhlet extraction equipment and other miscellaneous problems. A total of 1,809 samples sent to laboratories were not tested, but only 444 were because of equipment failure. Laboratories have referred samples to another HSC laboratory for testing when required because of equipment failure. This referral system provides proper backup testing response. Some testing delays or failures can be expected during the planned move or renovation at LAMC, St Louis, and Fort McPherson. With proper coordination, samples can be directed to other laboratories and proper support maintained. After final realignment actions and placement of equipment, test delays and failure should be reduced.

g. Veterinary Laboratory Technical Management.

(1) During the realignment/consolidation period, there has been a minimum of centralized technical management of the veterinary laboratories. Several actions were taken by HSC in regard to location, staffing, and added missions, but the technical aspects of veterinary laboratory operation was handled mainly by the individual Veterinary Corps offices in each laboratory. In most cases, the technical functions were well managed, but since no strong central guidance was present, the policies and operating procedures of each laboratory were slighly different. Each laboratory established testing priorities, ordered equipment based on local needs or desires, established their own quality control system, and operated to a large extent like an autonomous unit. These actions were really based on necessity and reflect a high degree of leadership and initiative by the officers and staffs of the veterinary laboratories. However, when laboratory reports and other workload data from all the laboratories are examined, the variation in operating policies becomes evident. Different policies exist on duplicate analysis, internal quality control actions, results reporting, testing priorities, and other laboratory actions. The basic testing methods of all the laboratories ahere very closely to the official methods prescribed by contract documents, but even in these minor variations have been noted. A centralized technical management system is required to assure uniformity in policy and procedures on laboratory administrative and technical procedures.

(2) The dichotomy that now exists in technical management between WRAIR as designated by AR 40-920 and BAMC as assigned by HSC must be resolved. Action now in progress to consolidate all technical management functions at BAMC are reasonable, if adequate additional resources are provided. Transfer of functions from WRAIR to BAMC with personnel spaces and special equipment should be adequate. Some modification of veterinary laboratory space in Building 2630 at Fort Sam Houston may be required to accommodate the transfer. The BAMC veterinary laboratory has adequate staff to provide direct support to the immediate geographical area, but does not have the staff or resources at this time to perform the special missions assigned by HSC. The close proximity of BAMC to Headquarters, HSC and to the Academy of Health Sciences does make it the location of choice for the veterinary reference and technical management functions. The technical as well as all other laboratory management functions should be at the HSC level and the assignment of certain technical functions to BAMC does permit daily staff contact with HSC and at the same time involves the technical operator directly with the mainstream of laboratory work. After the veterinary laboratories are completely realigned and the technical management systems is established, this arrangement should be reviewed, but for the time being it appears to be the preferred system.

(3) The study on laboratory quality assurance recently completed by Major Armstrong[7] outlines a program upon which to base a complete technical management program. It is certainly more far reaching than any previous technical management effort in the veterinary laboratories and is similar in many respects to the College of American Pathologists program for clinical laboratories. A substantial program such as this is necessary to assure the complete reliability and uniformity of all technical aspects of the veterinary laboratory service. In addition, the program should include preparation of reports, workload reporting data collection and certain other administrative features. The system must continue to reply heavily on the individual laboratories for professional management, but the HSC quality assurance program should support and verify their effort.

h. Wartime and Mobilization Requirements.

(1) This study did not deal in any depth with wartime and mobilization requirements. While this is an important question, the time and resources were not at hand to study this subject. Several individual laboratory officers were questioned, and generl comments received were helpful. A special study involving total veterinary service requirements during wartime or in contingencies by the Army Study Program (HSCD) may be indicated.

(2) The general opinion stated was that the food analysis service of veterinary laboratories will remain at about the same scope, but increase in volume as subsistence procurement increases. This is based on experience with the Vietnam war and earlier years. Some additional requirements may be placed on veterinary laboratories for wholesomeness, safety and sanitary determinations, but most likely subsistence would be issued rather quickly so that chronic storage and deterioration problems would be minimized. The matter of CBR and environmental contaminants is not properly considered here. Comments are furnished on the CBR aspects of food inspection and laboratory support in the discussion on CBR, paragraph j.

(3) Equipment and capacity studies indicate that the current laboratories, if given additional staff, could easily double or triple work output. Basic facilities and equipment for support of a heavier workload are now present. Of course, three of the laboratories are now in the process of moving or renovating and this could influence expansion potential, but it should cause an improvement. The question may be raised here concerning the location and number of veterinary laboratories required for wartime or mobilization support. No ready answer exists, but it seems that the best support both in a peacetime and mobilization configuration can be provided to a laboratory that is consolidated with a Medical Center.

(4) The transporting of samples may be a more difficult problem, but the support and management of an isolated laboratory, difficult even in peacetime, would certainly be more difficult or even impossible in wartime. For a large or total mobilization, branch or field laboratories could be set up in areas of heavy subsistence procurement activity.

(5) The diagnosis of zoonotic and animal diseases, usually managed by other agencies, may be a special problem during total mobilization.

(6) The military veterinary laboratories may be required to assist or even deal with some of the animal disease problems without assistance. Veterinary laboratories amalgamated with Medical Centers are in a much better position to coordinate this type of support service. The rather recent episodes of animal disease outbreaks in this country in which the US Army and Air Force veterinarians provided assistance (Exotic Newcastle Disease and Venezuelan Equine Encephalomyelitis) are examples of potential support that may be needed.

i. Laboratory Results Reporting.

(1) The fundamental requirement in laboratory reporting is to furnish complete results to the responsible agency as quickly as possible. Fresh dairy laboratory test results are sent to the administrative contract inspector (ACI) and all verification and acceptance test results are sent to the Technical and Quality Assurance Division of DPSC. In certain instances, test reports are given multiple distribution and special test results are given different distributions, but all results go to the proper quality assurance official. Copies of all test results are sent to Headquarters, HSC for review. Transmission of results is usually by mail, but telephone reports are made when requested or when unusual findings are observed. File copies of all test reports are retained in the individual laboratories and at the present time, the information copies of all test reports are filed by HSC after review.

(2) These reports contain a considerable amount of information on the characteristics of subsistence items that would be helpful in writing specifications, establishing quality assurance procedures, and detecting problem areas. Portions of this information is occasionally extracted manually but in general, no one has all of the total information available on laboratory findings in a utilizable form. In reality, after the immediate quality assurance actions are completed, the laboratory data is not utilized any further. The immediate purpose of product quality assurance is served well but the data is not available for long range planning and management. For example, we do not know how many butterfat tests are done, and how many are nonconformances. While this data is actually on file, it is not in a form that can be utilized without

considerable clerical effort. An exception to this is the data on food microbiological findings that has been computerized by COL Fowler at Letterman Army Institute of Research.[8]

(3) There is no requirement to computerize or use an ADP system for direct reporting of veterinary laboratory results. The central recording of all laboratory results so they could be used for planning and management would certainly be helpful, however, the cost effectiveness of this endeavor may be questionable. Perhaps until a specific need is identified for this computerized data, the current system of reporting and reviewing laboratory results should be continued.

j. CBR Capabilities of Veterinary Laboratories.

(1) This study clearly established the fact that all CONUS veterinary laboratories are completely out of the radiological detection field. No instruments of any consequence and no real capability to perform any radionuclide detection or identification remains. The veterinary laboratory officers have received some training in radiocontaminants in foods at the WRAIR course and some of the more senior chemists have had considerable training and experience in this work. All of the laboratories have a small library on radioisotope work and the old training manuals from WRAIR, but this is the only tangible remnant of a program that was very active in the early 1960's.

(2) Veterinarians were heavily involved in the radioisotope programs that were started in the former US Army Medical Laboratories twenty years ago. This was prior to the addition of sanitary engineers to the laboratory complement and prior to any extensive use of radioisotopes for clinical diagnostic tests. Veterinarians performed the first T-3 throid function tests in many of the laboratories primarily because the detection equipment was under their management. This trend continued with veterinary personnel performing radioimmune assay procedures, some of which replaced the use of animals for hormone assays. All during this time the veterinary personnel, trained by WRAIR, conducted radioisotope studies on milk, beef thyroid glands, water, air and other food and environmental samples. WRAIR sent out proficiency survey samples and provided methodology and excellent technical assistance.

(3) In recent years the use of radiochemical diagnostic tests has become common and the Medical Center laboratories now have a special section just for this work. The environmental sciences developed greatly and assumed some of the environmental testing formerly done by veterinary sections. The radioisotope detection work was difficult to support in a medical laboratory because it was expensive and a workload requirement could not be demonstrated. No real organized program existed for screening food samples for radiocontaminants. This

was done almost entirely under the auspices of the laboratory, with little command direction. With the realignment/consolidation, all of the good detection instruments for environmental levels of radiocontaminants were transferred to the US Army Environmental Hygiene Agency regional activities. The remaining instruments and most of the radioimmune assay and other diagnostic radioisotope work has been transferred to clinical chemistry sections. The total spectrum of laboratory radioisotope work, performed over the past years by veterinary personnel, has now been entirely eliminated from the veterinary laboratory sections.

(4) Developments in the environmental sciences and radiochemical diagnostic procedures during recent years warrant the reassignment of these specialized functions to separate units that can devote a full time effort. The question of who will perform radioisotope detection work on subsistence has never been dealt with directly during the laboratory realignment/consolidation process. Perhaps the actions taken over the past few years have really answered the question. There is really no great necessity to detect and identify environmental levels of radiocontaminants by a central laboratory during a nuclear war situation. Veterinary food inspection personnel now have field survey instruments that can effectively screen subsistence, and are trained in cleanup procedures. Long term screening for radiocontaminants and other environmental problems in this area are the responsibility of the US Army Environmental Hygiene Agency or other Federal agencies. Now that environmental science personnel have been separated from the Medical Center laboratories, the opportunity for close collaboration between veterinarians and sanitary engineers has been minimized. As the situation has now developed, it would seem that field veterinary food inspection personnel have full responsibility for determining radioactivity in foods and making proper disposition recommendations. The USAEHA has responsibility for environmental levels of radiocontaminants in all environmental samples. The Medical Center veterinary laboratories are entirely out of the food radioisotope business, and it should probably stay that way. However, the subject of radiocontaminant detection in food subsistence should probably be considered in more detail by the Army Study Program (HCSD).

k. Laboratory Test and Workload Reports.

(1) Laboratory results of food analysis procedures on DD Form 1222 are submitted to HSC from all CONUS laboratories. The data on the reports is not really in a form that can be readily reviewed and utilized. This problem has already been discussed in paragraph 1 of this report. Information such as the number of specimens, number of procedures, and testing time can be obtained, but it requires considerable clerical work in going through the many individual reports. In spite of this drawback, the DD Form 1222's can be quickly scanned to obtain a good

general impression of the type and quality of work each laboratory has produced during the month.

(2) The report required by AR 40-24 is not received at HSC, but some of the laboratories furnish the feeder data used to prepare this report. This list of test procedures provides some information on laboratory work output, but does not include all data necessary for complete monitoring. Probably the monthly data prepared for the AR 40-24 report plus a supplemental report on samples, specimens, diagnostic tests, and laboratory animals would be sufficient for normal monitoring. Additional quality assurance data recommended by Major Armstrong[7] on equipment, methods, and intra-laboratory controls will be required for proper technical management.

(3) Frequent contact with the laboratories by telephone is a necessity for handling many problems and actions. This kind of contact and communication is easy to accomplish with only five CONUS based HSC veterinary laboratories.

1. Overseas Veterinary Laboratories.

(1) 10th USAML, Europe. This well established laboratory is supporting food inspection and veterinary laboratory requirements throughout Europe and in several Middle Eastern countries. It has a very active food analysis mission, especially with the dairies that are supplying fresh milk and other products to the military forces in Europe. This program of providing some laboratory training for food inspectors stationed in these dairies and followup control by survey samples and on-site visits is commendable. It now is the only one of the veterinary direct support laboratories that has a large sheep flock for whole blood supply. The laboratory also provides rabies diagnostic service and other veterinary support services. It is a very essential part of the medical and veterinary support of US Forces in Europe and the Middle East. The failure of the ether fume disposal system caused significant loss of ability to properly perform the testing mission. This rather severe defect should be corrected in the interest of safety and proper testing capabilities.

(2) USAML, Pacific. This laboratory was very active during the Vietnam war years and after. It has a large area support mission and provided much support in Vietnam conflict until the 9th Medical Laboratory was established there. The laboratory has had a large research mission for many years and is well known for this work. However, since 1972, the R&D mission and other veterinary workload has declined. The restriction placed on the import of rabies specimens by the Government of Japan has limited the ability of the laboratory to support Korea and other Asian countries. During the past few years, rabies suspect specimens from Korea have been sent by air to the Medical Laboratory

at Fort Baker, CA. Dairy products and other food samples from Korea are still sent to the laboratory. The laboratory reports (Appendix O) that most of the workload is recombined dairy products, foods, water and other subsistence items. Rabies diagnostic service is provided for US Forces in Japan, but the country is now considered to be rabies-free. Major Harold W. Lupton, VC, present Chief of the Department of Veterinary Medicine reports that the future of the laboratory is very uncertain with the proposed transfer to the Navy by 31 December 1976. He favors a transfer of the mission to Letterman Army Medical Center and states that approximately equal service could be obtained for all areas, except Japan, and considerable economy would be realized. Other alternatives are available with some advantages and obvious limitations. Veterinary laboratory support must be continued for US Forces in Korea, Japan and the western Pacific area. A more critical appraisal than that afforded by this report is necessary.

(3) USAML, Hawaii. The Schofield Barracks veterinary laboratory is performing food testing work in support of food inspection activities in Hawii. The survey response indicated interest in improving the laboratory operation and a desire to participate in the proficiency survey sample program.

6. CONCLUSIONS.

a. Status and Location of Veterinary Laboratories.

(1) The three veterinary laboratories that were closely aligned with and physically situated in Medical Centers (BAMC, LAMC, and WRAMC) have continued to function well during the realignment/consolidation process. Command, technical management and administrative support has been satisfactory. The large Medical Center laboratory environment is the ideal location for the small veterinary laboratory because of the excellent overall management and many professional advantages. The veterinary laboratory can provide animal care, consultation on zoonoses, special diagnostic services on animal diseases such as rabies, and assist in many other ways. The Medical Center laboratory facilities and equipment provide backup support, and special reference assistance in microbiology, parasitology, pathology and other laboratory science disciplines. This arrangement affords economy of operation, is in consonance with the Medical Laboratory realignment/consolidation philosophy and conforms to current concepts of proper laboratory management.

(2) The operation of separate, isolated veterinary laboratories such as those at St Louis and Fort McPherson cannot be justified on any basis. Proper management and support of these separate units is expensive and difficult. The service they can provide is limited and professional interchange with other laboratory officers is

restricted. This problem has been clearly recognized at Fort McPherson, and the Commander, DDEAMC has taken action to move the veterinary laboratory to Fort Gordon and consolidate it with other laboratory services there. This is a correct course of action and should be expedited.

(3) The St Louis laboratory faces problems of command, technical management, and administrative support of a serious nature. The building and facilities are old and in need of renovation. Even if this is accomplished, the future of the old Federal building in which the laboratory is located is in question. The laboratory is totally isolated and remote from any other military laboratory association. The only resolution of the problems faced by the St Louis laboratory is to move it to a Medical Center, such as Fitzsimons or to close the laboratory and transfer its functions equally to the other four veterinary laboratories in CONUS.

b. Total HSC Veterinary Laboratory Capacity.

The study indicated that under the staffing and conditions existing during the 12-month period, that about four and one half laboratories could have done the required testing at an acceptable level. Most test failures were due to shipment damage, but some were caused by lack of equipment or equipment failure. The total system response was such that no significant decrease in laboratory service would be expected if the number of laboratories was reduced to four.

c. Veterinary Laboratory Services.

About 90% of the veterinary laboratory workload is chemical and microbiological food analysis. All laboratories, except St Louis are performing rabies diagnostic service and other animal disease diagnostic services are increasing. The DDEAMC laboratory at Fort McPherson is a good example of an expanded animal disease diagnostic laboratory. Tests on human clinical specimens, such as the T-3 and radioimmune assays, have been almost entirely transferred out of the veterinary laboratories. The veterinary laboratories have considerable potential for conducting tests for the zoonotic diseases, such as leptospirosis, brucellosis and other special diagnostic tests. Medical Center commanders should review their requirements and utilize the veterinary laboratories in this regard. Laboratory animal requirements have decreased during the past few years as many diagnostic tests have been converted to invitro procedures. Special analytical tests, such as pesticide analysis, heavy metal detection, and vitamin procedures should be centralized in one or two laboratories for proper quality control and economy of operation. Veterinary laboratory personnel should collaborate with other laboratory sections in providing a complete veterinary testing service in the areas of toxicology, pathology, clinical chemistry, parasitology and other professional disciplines.

d. Staffing of Veterinary Laboratories.

Total number of personnel assigned during the 12-month period was adequate most of the time but some testing delays were experienced during heavy sample receipt periods. The number of personnel assigned was the limiting factor on output; equipment capacity and other facilities would permit double or triple the work output. The laboratories have different staffing arrangements which vary from no enlisted military personnel at DDEAMC to nine at BAMC. DDEAMC has no chemist and three of the laboratories have no microbiologist. Two Veterinary Corps officers assigned to each laboratory, except St Louis, provide considerable direct supervision in the microbiology-animal care areas and the junior officer is involved directly in diagnostic tests. Several vacancies exist in the 92B Medical Laboratory Specialist positions in the laboratories that have such authorizations. The 91R Food Inspection Specialist is authorized in some laboratories, but they are out of their career field in the laboratory and usually do not stay very long. With the heavy food analysis workload, chemist and chemistry trained technicians are required for key positions. At least one microbiologist should be on the staff of each veterinary laboratory to perform the increasingly important food microbiology tests and assist with diagnostic work. Continued civilianization of vacant enlisted positions should be done when workload increases require more personnel.

e. Officer and Enlisted Training.

An annual veterinary laboratory officers procedures course is required to train Veterinary Officers entering the laboratory field. This training, now given at WRAIR, could be given by the Academy of Health Sciences in collaboration with the Veterinary Laboratory Division, Brooke Army Medical Center, if this function is transferred. A refresher or current trends course is necessary for laboratory officers that are assigned to laboratories. A one-week course every two years would be adequate. This course should be given in Washington, DC, where other military and Federal agencies can participate, or as an alternate plan, the course could be rotated among the Medical Centers that have veterinary laboratories. Veterinary officers remaining in the career field should be given long term civilian training at the graduate level in microbiology, virology, food technology or other laboratory science disciplines. Enlisted personnel should be trained for advancement in their MOS. Short courses, correspondence courses, professional meetings and other training of this type should be encouraged for all personnel.

f. Laboratory Equipment.

All laboratories have been in their present location for many

years and have equipment that varies in age and condition. Replacement through the MEDCASE program has been fairly effective, although some equipment purchase has been delayed at times. Repair and maintenance is generally good although some of the nonstandard food testing items have been difficult to service. Arrangement and location of some equipment is not ideal due to building space limitations. Planned renovation and moves will greatly improve this situation. Most standard equipment items used to conduct a majority of the testing are well maintained and are in good condition. Equipment transfers from the Defense Subsistence Testing Laboratory have provided extra equipment for all laboratories, excess to their needs in some cases. Transfer of some equipment from Fort Leavenworth, LAMC and WRAMC to BAMC for specialized reference testing is now being done. Equipment that is used less than weekly, such as gas chromatographs, atomic absorption spectrophotometers, for conducting special tests should be centralized in one or two laboratories for improved testing service and economy of operation. Equipment capacity for the total HSC laboratory system exceeds current output requirements by 300% or enough reserve to triple testing if required by mobilization or contingencies. During the 12-month survey period, delays were experienced on combat rations testing because of limited Soxhlet fat extraction equipment at one laboratory. In this case, shifting of some samples to two other laboratories resolved the delay.

g. Veterinary Laboratory Technical Management.

The technical management of the HSC veterinary laboratories is really shared by WRAIR and BAMC at this time. WRAIR had the sole responsibility for the technical aspects of the old US Army Medical Laboratory veterinary sections, and this responsibility was continued after the organization of HSC by a revision of AR 40-920. WRAIR has now requested that their teaching and diagnostic functions be transferred to HSC. Over the past two years, HSC has taken preliminary steps to establish the Veterinary Laboratory Division, BAMC as a special reference and quality control laboratory for technical management of other veterinary laboratories. The division of technical management that now exists is counterproductive and it is important that all technical management responsibilities be defined and consolidated with one agency. The concept of transferring all WRAIR responsibility over HSC veterinary laboratories to BAMC is a desirable solution, since BAMC is a stable, well equipped facility situated next to Headquarters, HSC and the Academy of Health Sciences. Major Armstrong's study on laboratory quality assurance and other work at BAMC has now formed the basis for an advanced technical management program. Full implementation of the program by BAMC will require some additional staff, most of which would come from WRAIR with the transfer of function.

h. Wartime and Mobilization Requirements.

Based on past experiences, wartime or mobilization would require greater subsistence procurement and handling and thus, a greater laboratory food testing workload. Animal disease diagnostic requirements may increase some. Equipment and capacity studies indicate that current laboratory facilities could support a 300% increase or triple the current work output, if adequate staff was provided. An increase in food procurement is not necessarily followed by a proportionate increase in laboratory food analysis. In such situations, the sample size may be the same for larger procurement lots and inovative means such as skip lot testing, reduced frequency testing, screening tests and other methods can be used to support larger procurements in times of emergency. Current laboratory capacity is considered flexible enough to support most expected wartime requirements. If the theatre of operations is CONUS, current fixed laboratories may not be of any value. Further study on the subject of mobilization requirements by the Army Study Program should be considered based on the findings and conclusions of the current TOMS study.

i. Laboratory Results Reporting.

Laboratory results are reported in many ways depending upon the type of specimen or sample and other factors. All verification and acceptance testing, as well as production, identification and evaluation and special testing on DPSC contracts or DPSC controlled subsistence is reported according to DPSC Handbook. Fresh dairy product test results are returned to the administrative contract inspector (ACI) and clinical specimen results are just returned to the submittor. Telephone reports are furnished when requested or when significant defects are noted. Copies of all food analysis reports are sent to Headquarters, HSC for review. All food microbiology gindings are sent to COL Fowler at the Letterman Army Institute of Research. The raw data on the reports is filed, but is not usually used for anything except immediate quality assurance actions and review. The data would be helpful to managers, teachers, specification writers and others if it were computerized and easily available. This computerizing would not be helpful in the immediate reporting under the present system. It should be considered as a research project by someone, such as LAIR, that has experience and capabilities in this field.

j. CBR Capabilities of Veterinary Laboratories.

Veterinary laboratories have gradually phased out of food radionuclide detection. This capability was very well developed in the 1960's under guidance from WRAIR, but was gradually dropped for various reasons. During the realignment/consolidation process, the problem of food, radionuclide detection responsibilities was never directly considered, but

most equipment was transferred to the US Army Environmental Hygiene Agencies regional activities. For all practical purposes no capability remains in the veterinary laboratories for this work, except some reference material and a few experienced chemists. The detection of environment levels of radionuclides in foods is not considered by some radiobiologists to be a significant problem in a contingency situation. Veterinary food inspection personnel have well developed survey meters and are trained to screen foods and direct cleanup operations. Environmental levels of radionuclides in food, water, air and other material is the responsibility of other Federal agencies and the US Army Environmental Hygiene Agency.

k. Laboratory Test and Workload Reports.

No workload reports have been furnished by the veterinary laboratories to HSC on a routine basis. Certain data has been supplied from time to time upon which to base management actions, such as assigning areas of geographical responsibility. All of the completed food analysis reports, DD Form 1222, are sent to HSC but these reports are used more for monitoring quality assurance procedures than anything else. The laboratories have provided feeder data for the report required by AR 40-24, but this is not used by HSC. Recently, some of the laboratories are sending copies of the monthly AR 40-24 data report to the Veterinary Laboratory Consultant, HSC. A monthly report to HSC from each laboratory with all workload and quality control data is necessary for proper monitoring and technical management. This report should contain all data furnished for the AR 40-24 report, quality control data suggested by Major Armstrong's study and certain other status reports on equipment, personnel, facilities and problem areas.

l. Overseas Veterinary Laboratories.

(1) No visits were made to the overseas laboratories, however rather complete workload data and other correspondence was received from the laboratories in Japan, Hawaii, and Germany. All overseas laboratories are heavily engaged in food analysis work.

(2) The laboratory in Germany is supporting the extensive off-shore food procurement and food inspection activities in Europe and the Middle East. It has a large sheep flock and processes sheep blood for distribution to clinics and hospital laboratories. Rabies diagnostic work is performed. Difficulty with the repair of the ether fume disposal system was reported, with considerable downtime for fat testing. Workload in the Zama, Japan Laboratory has declined since 1972 at about 20% per year. The laboratory is now scheduled for transfer to the US Navy

not later than 31 December 1976, and it's future is uncertain. A review of laboratory support requirements for Japan, Korea and the western Pacific area may be necessary.

7. RECOMMENDATIONS.

a. Status and Location of Veterinary Laboratories.

(1) Recommend that all veterinary laboratories be consolidated with the Department of Pathology and Area Laboratory Services of a Medical Center.

(2) Recommend that in consonance with 7a(1) above, the veterinary laboratory at Fort McPherson, GA, be moved to Fort Gordon, GA, and consolidated with the Department of Pathology and Area Laboratory Services of Dwight D. Eisenhower Army Medical Center.

(3) Recommend that the Veterinary Food Testing Laboratory in St Louis, Missouri, be closed and the functions transferred to the four other HSC veterinary laboratories. Further recommend that a coordinated plan be developed by HSC for the transfer of function to LAMC, BAMC, DDEAMC, and WRAMC so the workload will be equitably divided.

b. Total HSC Veterinary Laboratory System Capacity.

Recommend that the total number of veterinary laboratories be reduced to four by closing the St Louis laboratory in accordance with 7a(3) above.

c. Veterinary Laboratory Services.

(1) Recommend that all veterinary laboratories provide a complete food analysis, laboratory animal care, and animal disease diagnostic service. In this regard, recommend that request for tests that cannot be done in the veterinary laboratory be done in collaboration with other Medical Center laboratory sections, or forwarded to an appropriate reference laboratory.

(2) Recommend that those tests or procedures which are requested infrequently and require expensive instrumentation or complicated methods, be centralized in one or two laboratories for reasons of efficiency and economy.

(3) Recommend that Medical Center commanders consider the potential existing in Veterinary Laboratory Divisions for diagnostic capabilities and assign zoonotic disease testing or other related clinical diagnostic tests to veterinary personnel when feasible.

d. Staffing of Veterinary Laboratories.

(1) Recommend that each veterinary laboratory be staffed with at least one veterinary microbiologist to perform food and animal disease diagnostic microbiological procedures.

(2) Recommend that each veterinary laboratory be staffed with two Veterinary Corps officers trained in direct support laboratory operations.

(3) Recommend that Food Inspection Specialists, MOS 91R, not be assigned to veterinary laboratories.

e. Officer and Enlisted Training.

(1) Recommend that a basic Veterinary Laboratory Officers Course be presented annually by the Academy of Health Sciences in collaboration with the Veterinary Laboratory Division, Brooke Army Medical Center to all Veterinary Corps officers prior to or during the first year of assignment in a veterinary laboratory.

(2) Recommend that a refresher type course such as Current Trends in Veterinary Laboratory Procedures be presented one time every two years and rotated between the Medical Centers where veterinary laboratories are located.

(3) Recommend that all Veterinary Corps officers pursuing a career in laboratories be given long term civilian training at the graduate level in food technology, microbiology, virology or other laboratory science disciplines.

f. Laboratory Equipment.

Recommend that each laboratory arrange equipment to maximize safety and work efficiency. Further recommend that special equipment used for bona fide test requests less than weekly should be centralized in one or two laboratories as designated by HSC, in accordance with c(2) above.

g. Veterinary Laboratory Technical Management.

(1) Recommend that all technical management responsibilities for HSC veterinary laboratories listed in AR 40-920 now assigned to WRAIR be transferred and assigned to BAMC.

(2) Recommend that the teaching and diagnostic function now performed by WRAIR be transferred to HSC, in accordance with the request

made by WRAIR in January 1976. It is further recommended that these functions be assigned to the Academy of Health Sciences and Brooke Army Medical Center as appropriate.

h. Wartime and Mobilization Requirements.

(1) Recommend that current equipment capacity and work space be maintained at the present level so that work output can be increased by 300% within 30 days by providing additional personnel.

(2) Recommend the question of wartime and mobilization requirements for veterinary laboratories be given further study by the Army Study Program, based upon findings and conclusions of the current TOMS study.

i. Laboratory Results Reporting.

Recommend no change in current reporting system and methods.

j. CBR Capabilities of Veterinary Laboratories.

(1) Recommend that reference to the radiological testing of food by veterinary laboratories be deleted from AR 40-920, local regulations and mission statements.

(2) Recommend that the question of veterinary laboratory CBR requirements be given further study by the Army Study Program based upon findings and conclusions of the current TOMS study.

k. Laboratory Test and Workload Report.

Recommend that an HSC monthly veterinary laboratory workload and quality control data report be developed to be used for proper monitoring and technical management of veterinary laboratory activities.

l. Overseas Laboratories.

(1) Recommend that adequate, safe ether fume disposal systems be properly installed and maintained in all laboratories.

(2) Recommend review of veterinary laboratory support requirements for Japan, Korea and the western Pacific and the development of plans to provide alternate support or continue the service now being provided.

REFERENCES

1. Memorandum for The Surgeon General, subject: Review of AMEDD Management and Operations; World-wide Laboratory Service (Task #15), dated 19 April 1974.

2. DA Message 005462, Public Affairs Guidance. Army Installation and Activity Reductions and Realignment, DAIO-PP, 172312Z March 1973.

3. Letter, DSAH-PV, Defense Supply Agency, subject: Request for Testing Support for Subsistence Products, dated 22 January 1975.

4. Letter, DASG-VCP, Office of The Surgeon General, subject: Request for Testing of Subsistence Products, dated 10 February 1975.

5. Letter, SGRD-UWN-F, Walter Reed Army Institute of Research, subject: Transfer of OMA-Funded Functions, dated 16 January 1975.

6. Letter, MEDFG-V, Dwight D. Eisenhower Army Medical Center, subject: Veterinary Laboratory Location, dated 17 October 1975.

7. Armstrong, Tommy S., Major, VC
Report HCSD-20, Veterinary Laboratory Quality Assurance Study, April 1976, Health Care Studies Division, Academy of Health Sciences, United States Army, Fort Sam Houston, TX 78234

8. Fowler, James R., Colonel, VC, US Army, On-Going Research in the Food Hygiene Division, Letterman Army Institute of Research, Department of Nutrition. Proceedings of the 17th Annual Symposium, Instructors of Food Hygiene, November 1975.

9. The Rand Corporation, "Military Equipment Cost Analysis", June 1971.

APPENDIX A

THRU

APPENDIX O

APPENDIX A

HSC VETERINARY LABORATORY PERSONNEL AUTHORIZATIONS

OFF	BAMC	DDEAMC	LAMC	ST LOUIS	WRAMC	TOTALS
C Vet Lab Off	1-05	1-05	1-04	1-04	1-04	
Vet Lab Off	1-03	1-03	1-03		1-03	
SUBTOTAL	2	2	2	1	2	9
EM						
92 B 40	1-E7		1-E7	1-E6		
92 B 30	1-E6				1-E6	
92 B 20	3-E5		2-E5	1-E5		
	2-E4		1-E4			
91 R 40					1-E6	
91 R 20	1-E5				1-E5	
91 R 10					1-E4	
71 B 30	1-E4					
91 T 20			1-E4		1-E4	
SUBTOTAL	9		5	2	6	22
CIV						
Chemist - GS-12-01320					1	
GS-11-01320	1		1	1	1	
GS-09-01320	2		2	1	2	
Med Tech Chem - GS-07-00645	1	2				
GS-06-00645				1		
GS-05-00645		2		2		
Microbiologist- GS-09-00403	1		1	1		
Biol Lab Tech - GS-07-00404			1		1	
GS-06-00404			1			
GS-05-00404	1		3			
GS-04-00404		1				
Phys Sci Tech - GS-07-01311					2	
GS-05-01311			1		1	
GS-04-01311	1					
Medical Tech - GS-09-00644		1				
GS-07-00644		1		1		
Clerk Steno - GS-04-00312		1				
GS-04-00301		1				
Clerk Typist - GS-04-00322			1	1	1	
Lab Worker - WG-04-05212			1	1		
Animal Caretaker- WG-05-07706	1	1				
Rec/Shpng Clerk-GS-03-02134				1		
SUBTOTAL	8	10	12	10	9	49
TOTAL AUTHORIZIED	19	12	19	13	16	79

* FROM APPROVED TDA DOCUMENTS AT HQ. HSC ON 1 AUGUST 1976.

APPENDIX B

VETERINARY LABORATORIES PARTICIPATING IN STUDY

HSC CONUS

Veterinary Medicine Section
Department of Pathology, Medical Laboratory
Walter Reed Army Medical Center
Fort George G. Meade, Maryland 20755
Autovon: 923-2930/2756

Veterinary Laboratory Division
Medical Laboratory Detachment (HSW3QM01)
Dwight D. Eisenhower Army Medical Center
Fort McPherson, Georgia 30330
Autovon: 588-3804/3364

Veterinary Laboratory Division
Department of Pathology and Area Laboratory Services
Brooke Army Medical Center
Fort Sam Houston, Texas 78234
Autovon: 471-2015/2761

Veterinary Laboratory Service Branch
USA MEDDAC, Fort Leavenworth
Main P.O. Box 209 (12th & Spruce Streets)
St. Louis, Missouri 63166
Autovon: 698-3529

Veterinary Medicine Section
Department of Pathology Reference Laboratory
Letterman Army Medical Center
Fort Baker, Sausalito, California 94965
Autovon: 586-7618/7638

OVERSEAS

Veterinary Division
USAREUR Medical Laboratory (Germany)
APO New York 09180
(Landstuhl, Germany)
(06371-86-8300/7241)

Veterinary Division
US Army Medical Laboratory, Pacific
APO San Francisco 96343
(Zama, Japan)

Veterinary Division
US Army Medical Laboratory
Schofield Barracks, Hawaii
APO San Francisco 96557
Tel: 655-4041

APPENDIX C

TOTAL HSC VETERINARY LABORATORY CAPACITY DATA

In the interest of obtaining an estimate of monthly workload distribution parameters without investing an unrealistic amount of time in data collection and analysis, the following approach was used:

(1) A Model* was selected which requires that the analyst know only the lowest, most likely, and highest values for each input parameter to be used in the model. Further, it must be assumed that there is a ten percent probability of the actual value being lower than L and a ten percent probability of the actual value being higher than H. Then, a simple approximation of the expected value becomes

$$\overline{X} = \frac{X_L + 4XM + X_H}{6}$$

and, employing the assumptions above, the range $X_H - X_L$ varies between 2.5 and 2.9 standard deviations for a wide class of distributions including rectangular, exponential, triangular, normal and beta. Thus, we write

$$X_H - X_L = 3\sigma_x$$

where σ_x is the standard deviation. Then,

$$\sigma_x = \frac{X_H - X_L}{3}$$

(2) Application of this model to the laboratory data is as follows:

	X_M	X_H	X_L	$\overline{x}$	σ_x
Ft Baker	1,196	1,327	625	1,122	234
St Louis	1,069	1,369	638	1,047	243
Ft Sam Houston	1,224	1,684	908	1,248	259
Ft Meade	770	1,257	577	819	226
Ft McPherson	1,151	1,327	429	1,060	299

APPENDIX C (cont)

Application of the workload distribution parameter estimates ($\bar{x}$ and σ_x) to the question of computing the probability that the individual Laboratories will exceed their respective capacities during a given month is:

	($C - \bar{x}$) in Std. Dev. Units	P (of exceeding this value)
Ft Baker	1.18	.12
St Louis	1.45	.07
Ft Sam Houston	1.74	.04
Ft Meade	2.57	.01
Ft McPherson	1.80	.03

The computed probability of NT or D due to reasons other than exceeding capacities were:

	P (NT or D)
Ft Baker	.040
St Louis	.036
Ft Sam Houston	.010
Ft Meade	.035
Ft McPherson	.036

Combining the input parameters for the five Labs provides:

	X_m	X_H	X_L	$\bar{X}$	σ_x
System (5 Labs)	5410	6960	3175	5295	1261

and a combined system probability of exceeding capacity (at .10 Level) of .04.

Similarly, for less than five Labs:

4 Labs	.29
3 Labs	.73
2 Labs	.96
1 Lab	.99

Reference

* - The Rand Corporation, "Military Equipment Cost Analysis," June 1971.

APPENDIX D

CLINICAL SPECIMENS RECEIVED AND TESTED BY VETERINARY DIVISIONS OF HSC MEDICAL LABORATORIES DURING THE 12-MONTH PERIOD, 1 APR 75 - 31 MAR 76

LAB/SPECIMENS	BAMC	DDEAMC	LAMC	ST LOUIS	WRAMC	TOTAL
Human Origin						
Urine	147	21			77	245
Blood/Serum	2,184	234	107	570		3,095
Other			5		12	17
SUBTOTAL	2,331	255	112	570	89	3,357
Animal Origin						
Brain or Heads	131	250	255		9	645
Horse Serum	25	545	538			1,108
Urine		22				22
Blood or Serum	9	1,239				1,248
Histopath		194				194
TOTAL	165	2,250	793	0	9	3,217
GRAND TOTAL	2,496	2,505	905	570	98	6,574

SUMMARY OF DIAGNOSTIC TEST RESULTS OF SPECIMENS FOR 12-MONTH PERIOD

	BAMC	DDEAMC	LAMC	ST LOUIS	WRAMC	TOTAL
Rabies, FA Diagnosis	131	250	255		9	645
Rabies, Serum Neutralization	163	*	162			325
EIA (Coggins) Test	28	519	532			1,079
Leptospirosis, Serological		597				597
Brucellosis		393				393
Human Chorionic Gonadotropin	475	730		17		1,222
UCG or Human Pregnancy	147	42				189
Tularemia		332				332
OX-19		211				211
Salmonella		219				219
Trichinella		17				17
Venipuncture/Bleedings			99			99
Nitrogen Body Fluids			56		89	145
Vitamin B_{12}, RIA				12		12
T-3, Thyroid Function				541		541
Folic Acid, RIA	2,048					2,048
TOTAL	2,992	3,310	1,104	570	98	8,074

APPENDIX E

LABORATORY ANIMAL COLONY OPERATIONS OF HSC MEDICAL LABORATORIES
DURING THE 12-MONTH PERIOD, 1 APRIL 1975 - 31 MARCH 1976

BAMC

Animal	Inventory on 30 Mar 76	Avg Daily Inventory	Produced in 12 mo.	Procured in 12 mo.	Issued or Used/Year	Major Use
Mouse	1,200	1,215	7,959	----	6,500	Rabies
Rat	10	16	41	----	25	Serology
Guinea Pig	----	5	3	----	5	Serology
Hamster	17	16	11	24	24	Parasitology
TOTAL	1,228	1,252	8,041	24	6,554	

DDEAMC

Animal	Inventory on 30 Mar 76	Avg Daily Inventory	Produced in 12 mo.	Procured in 12 mo.	Issued or Used/Year	Major Use
Mouse	190	170	1,854	----	1,431	Rabies
Guinea Pig	4	14	32	20	62	Entomology
Rabbit	----	13	34	----	47	Virology
TOTAL	194	197	1,920	20	1,540	

LAMC

Animal	Inventory on 30 Mar 76	Avg Daily Inventory	Produced in 12 mo.	Procured in 12 mo.	Issued or Used/Year	Major Use
Mouse	788	481	5,955	100	4,326	Rabies
Guinea Pig	21	22	33	----	55	Serology
Hamster	20	21	140	----	66	Parasitology
Rabbit	17	17	5	----	-----	Serology
Sheep	1	1	1	1	1	Bacteriology
TOTAL	847	541	6,134	101	4,448	

WRAMC

Animal	Inventory on 30 Mar 76	Avg Daily Inventory	Produced in 12 mo.	Procured in 12 mo.	Issued or Used/Year	Major Use
Mouse	951	1,263	16,896	----	7,932	Virology
Rat	28	28	110	----	52	Rabies
TOTAL	979	1,291	17,006	0	7,984	

SUMMARY - COMBINED LAB ANIMAL DATA FOR HSC LABORATORIES

Animal	Inventory on 30 Mar 76	Avg Daily Inventroy	Produced in 12 mo.	Procured in 12 mo.	Issued or Used/Year
Mouse	3,129	3,129	32,664	100	20,189
Rat	38	44	151	---	52
Guinea Pig	25	41	68	20	55
Hamster	37	37	151	24	90
Rabbit	17	30	36	---	47
Sheep	1	1	1	1	1
	3,247	3,372	33,071	145	20,434

APPENDIX F

FOOD SAMPLES RECEIVED AND TESTED BY VETERINARY DIVISION OF HSC MEDICAL LABORATORIES FOR THE 12-MONTH PERIOD, 1 APRIL 1975 - 31 MARCH 1976

TOTAL SAMPLES TESTED

LABORATORY	BAMC	DDEAMC	LAMC	ST. LOUIS	WRAMC	TOTAL
Total Samples Rec	14,689	8,908	14,352	12,836	9,238	60,023
Fr & Frz Dairy Prod	10,897	4,912	5,466	6,757	5,405	33,437
Mfg & Other " "	1,147	192	854	1,023	202	3,418
Fr, Frz & Cured Meat	1,103	794	1,801	1,556	763	6,017
Rations & Canned Meat	31	1,289	451	2,717	1,118	5,606
Srtng, Fats & Oils	0	0	124	0	92	216
Cereals, Cond. Spices	0	0	597	0	655	1,252
Dried, & Dehy Prod	90		1,127			1,217
Salads, Prep	162			108	208	478
*Miscellaneous	1,118	1,390	3,386	209	470	6,573
TOTAL TESTED	14,548	8,577	13,806	12,370	8,913	58,214

SAMPLES NOT TESTED

	BAMC	DDEAMC	LAMC	ST. LOUIS	WRAMC	TOTAL
1. Damaged	124	281	437	241	259	1,342
2. Unable	14	21	92	5	0	132
3. Lab Accidents	3	3	17	0	0	23
4. Forwarded	0	26	0	220	66	312
TOTAL NOT TESTED	141	331	546	466	325	1,809

QA & SURVEY SAMPLES

	BAMC	DDEAMC	LAMC	ST. LOUIS	WRAMC	TOTAL
Similac or Half & Half	424	125	702	121	13	1,385
Nutrimat	473					473
Potted Meat	249	121	1,294	88	13	1,765
WRAIR Survey	4	4	4	4	4	20
HSC Survey	2	2	2	2	2	10
TOTAL SURVEY	1,152	252	2,002	215	32	3,653

*Miscellaneous food samples consisted of: Fruit Drink, Meal Pre-Cooked, Salads, Sandwiches, Tuna, Salad Dressing, Instant Coffee, Mushrooms, Beans, Eggs, Bread, Beer, Soda Pop, Blackberries, Sweet Potatoes, Donuts, Bananas, Pimento, Soy & Meat Sauce, Spaghetti, Oysters, Shrimp, Sauerkraut, Onions, Vanilla Pudding, Sardines, Tomato Juice, Molasses, Food Coloring, Dog Food, Lobster, Candy Bar, Cranberry Sauce, Cat Food, Olives, Corn, Condiments, Tomatoes, Applesauce, Apples, Flavoring, Vinegar, Grape Jelly, Cereal, Biscuits, Coffee, Bouillon, and Corn Starch.

APPENDIX G

LIST OF MAJOR EQUIPMENT (VALUE OVER $200.00)

IN HSC VETERINARY LABORATORIES

	BAMC	DDEAMC	LAMC	ST. LOUIS	WRAMC
Analyzer, Orsat	1	1	1	1	1
Analyzer, Oxygen			3		1
Balance, Analytical	12	4	9	6	7
Balance, Top Loading	1	3		4	3
Bath Oil, AOM			1		2
Bath Water	7	7	4	10	1
Calculator	4	2	2	3	2
Centrifuge, Floor	4	1	2	1	1
Crude Fiber Apparatus			1		
Cryoscope (Osmometer)	1		1	1	1
Colorimeter					1
Freezer	6	2	2	2	4
Furnace, Muffle	1	1		1	1
Gas Chromatograph	1	2	2	1	2
Generator Hydrogen			1		
Grinder or Chopper	1	1	1	4	2
Hot Plate, Steam	2	2	1		1
Incubator	4	2	2	6	2
Kjeldahl Apparatus	1	1	1	1	1
Meter, pH.	2	4	2	2	3
Microscope, FA	1	1	1	1	1
Microscope, Optical	4	3	1	1	2
Mill, Wiley	1		1		
Mixer, Solubility	2				
Oven Convection	5	1	7	2	3
Oven Heater		3			
Oven, Vacuum	3	2	4	2	1
Polarimeter (Saccharimeter)	1				1
Refractometer, Abbe	1	1	2	1	1
Refrigerator	6	6	8	7	4
Spectrophotometer	1	1	1	1	1
Soxhlet, Extraction Units	16	30		1	7
SFI Bath			6		7
Titrimeter	4			1	

APPENDIX H

BAMC FOOD ANALYSIS PROCEDURES AND TESTS FOR THE 12 MONTH PERIOD, 1 APRIL 1975 - 31 MARCH 1976

General Food Chemistry

Procedure or Test	(1) Number of single or 1st test procedures	(2) Number of duplicate or extra procedures	(3) Quality Control & other tests	(4) TOTAL TESTS for the Year
Acidity, Titrateable	1,753	92		1,845
Added Water (Cryoscope)	2		2	4
Ash, Muffle or Wet	22	23		45
Brix Value	23			23
Fat (Roese-Gottleib)	4,183	4,183	1,136	9,502
Fat (Soxhlet)	727	727	218	1,672
Gas (Orsat)	74			74
Leak Test	20			20
Moisture (Oven Method)	624	624	174	1,422
Moisture (Toluene Method)	83			83
Nitrate or Nitrites	32			32
Phosphatase Activity	2,290		212	2,502
pH Value	681		120	801
Protein (Kjeldahl)	302	301	240	843
Protein Coagulation	119	119		238
Salt (Total Chlorides)	353	353	172	878
Scorched Particle	38			38
Solids, Total (Dairy)	1,925	962	754	3,641
Solubility Index	38			38
TOTAL	13,289	7,384	3,028	23,701

Fats, Shortening and Edible Oils

Procedure or Test	(1)	(2)	(3)	(4)
Free Fatty Acid	19			19
Peroxide Value	16			16
TOTAL	35			35

Special and Miscellaneous Chemistry

Procedure or Test	(1)	(2)	(3)	(4)
Heavy Metals	283			283
Meat Extenders (soy, cereal, whey)	181			181
Minerals	16			16
Physical (wt. vol.)	26			26
Sieve Test	31			31
TOTAL	537			537

APPENDIX H (cont)

BAMC FOOD ANALYSIS PROCEDURES AND TESTS FOR THE 12 MONTH PERIOD, 1 APRIL 1975 - 31 MARCH 1976

Food Microbiology Procedure or Test	(1) Number of single or 1st test procedures	(2) Number of duplicate or extra procedures	(3) Quality Control & other test	(4) TOTAL TESTS for the year
Anaerobic Culture	200	337		537
Coliform or E. Coliform	7,123	7,123	470	14,716
Direct Smear or Stain	2			2
Streptococci or Staph	129	30		159
Salmonellae	162	641	10	813
SPC or Aerobic Count	5,394	5,394	674	11,462
Yeast and Mold Count	447	895	164	1,506
TOTAL	13,457	14,420	1,318	29,195

Recapitualation

Procedure or Test	(1)	(2)	(3)	(4)
General Food Chemistry	13,289	7,384	3,028	23,701
Shortening and Oils	35			35
Chemistry	537			537
Food Microbiology	13,457	14,420	1,318	29,195
GRAND TOTAL	27,318	21,804	4,346	53,468

APPENDIX I

DDEAMC, FOOD ANALYSIS PROCEDURES AND TESTS FOR THE 12 MONTH PERIOD, 1 APRIL 1975 - 31 MARCH 1976

General Food Chemistry Procedure or Test	(1) Number of single or 1st test procedures	(2) Number of duplicate or extra procedures	(3) Quality Control & other test	(4) TOTAL TESTS for the year
Acidity, Titrateable	489			489
Brix Value	5			5
Fat (Roese-Gottleib)	3,377	942	240	4,559
Fat, (Soxhlet)	1,538	755	192	2,485
Gas (Orsat)	20			20
Moisture (Oven Method)	2,326	668		2,994
Phosphatase Activity	445		226	671
pH Value	213		114	327
Protein (Kjeldahl)	3	2		5
Salt (Total Chlorides)	842	53	24	919
Solids, Total (Dairy)	1,465	409		1,874
TOTAL	10,723	2,829	796	14,348

Fats, Shortening and Edible Oils

Procedure or Test	(1)	(2)	(3)	(4)
Free Fatty Acid	13	6	2	21
Peroxide Value	89	22	18	129
TOTAL	102	28	20	150

Special and Miscellaneous Chemistry

Procedure or Test	(1)	(2)	(3)	(4)
Bread, Solids	146			146
Heavy Metals	1		2	3
Meat Extenders (soy,cereal,whey)	29		8	37
Minerals	2			2
Pesticides	25	12		37
Physical (wt. vol.)	149			149
Ranicidity, Phloroglucinol	9	4	4	17
TOTAL	361	16	14	391

APPENDIX I (cont)

DDEAMC, FOOD ANALYSIS PROCEDURES AND TESTS FOR THE 12 MONTH PERIOD, 1 APRIL 1975 - 31 MARCH 1976

Food Microbiology Procedure or Test	(1) Number of single or 1st test procedures	(2) Number of duplicate or extra procedures	(3) Quality Control & other tests	(4) TOTAL TESTS for the year
Anaerobic Culture	308			308
Coliform or E. Coliform	4,029	192		4,221
Direct Smear or Stain	100	50		150
Microanalytical Exam	35			35
Streptococci or Staph	334			334
Salmonellae	317			317
SPC or Aerobic Count	4,106	576		4,682
Yeast and Mold Count	675			675
TOTAL	9,904	818		10,722

Recapitualation Procedure or Test	(1)	(2)	(3)	(4)
General Food Chemistry	10,723	2,829	796	14,348
Shortening and Oils	102	28	20	150
Special & Misc. Chemistry	361	16	14	391
Food Microbiology	9,904	818		10,722
TOTAL	21,090	3,691	830	25,611

APPENDIX J

ST. LOUIS, MO., FOOD ANALYSIS PROCEDURES AND TESTS FOR THE 12 MONTH PERIOD, 1 APRIL 1975 - 31 MARCH 1976

General Food Chemistry

Procedure or Test	(1) Number of single or 1st test procedures	(2) Number of duplicate or extra procedures	(3) Quality Control & other tests	(4) TOTAL TESTS for the year
Acid Phosphatase (Cooking Temp)	4		9	13
Acidity, Titrateable	280	108	60	448
Added Water (Cryoscope)	10	10	20	40
Ash, Muffle or Wet	16	16		32
Brix Value	28	28		56
Copper (In Cheese)	31	31	4	66
Crude Fiber	10	10	5	25
Fat (Roese-Gottleib)	2,280	1,640	92	4,012
Fat (Soxhlet)	3,200	2,700	225	6,125
Gas (Orsat)	99	99		198
Moisture (Oven Method)	1,684	1,884	75	3,643
Moisture (Toluene Method)	76	76	10	162
Nitrate or Nitrites	23	23	46	92
Phosphatase Activity	1,700	230	110	2,040
pH Value	250	250	40	540
Protein (Kjeldahl)	346	346	80	772
Protein Coagulation	4			4
Protein Reducing Subst.	24	24	8	56
Salt (Total Chlorides)	2,800	822	298	3,920
Scorched Particle	30	30		60
Solids, Total (Dairy)	1,570	1,770	40	3,380
Thiobarbituric Acid (TBA)	63	63	86	212
TOTAL	14,528	10,160	1,208	25,896

Fats, Shortening and Edible Oils

Procedure or Test	(1)	(2)	(3)	(4)
Free Fatty Acid	113	113	26	252
Peroxide Value	38	38	19	95
TOTAL	151	151	45	347

Special and Miscellaneous Chemistry

Procedure or Test	(1)	(2)	(3)	(4)
Heavy Metals	31	31	4	66
Meat Extenders (soy,cereal,whey)	80	80	20	180
Sieve Test	4	4		8
TOTAL	115	115	24	254

APPENDIX J (cont)

ST. LOUIS, MO., FOOD ANALYSIS PROCEDURES AND TESTS FOR THE 12 MONTH PERIOD, 1 APRIL 1975 - 31 MARCH 1976

Food Microbiology Procedure or Test	(1) Number of single or 1st test procedures	(2) Number of duplicate or extra procedures	(3) Quality Control & other tests	(4) TOTAL TESTS for the year
Anaerobic Culture	242		20	262
Coliform or E. Coliform	3,398	1,699	180	5,277
Direct Smear or Stain	300			300
Microanalytical Exam	125			125
Streptococci or Staph	40	40		80
Salmonellae	80	80	8	168
SPC or Aerobic Count	3,617	3,617	410	7,644
Yeast and Mold Count	300	300	40	640
TOTAL	8,102	5,736	658	14,496

Recapitualation

Procedure or Test	(1)	(2)	(3)	(4)
General Food Chemistry	14,528	10,160	1,208	25,896
Shortening and Oils	151	151	45	347
Special & Misc. Chemistry	115	115	24	254
Food Microbiology	8,102	5,736	658	14,496
GRAND TOTAL	22,896	16,162	1,935	40,993

APPENDIX K

LAMC, FOOD ANALYSIS PROCEDURES AND TESTS FOR THE 12 MONTH PERIOD, 1 APRIL 1975 - 31 MARCH 1976

General Food Chemistry

Procedure or Test	(1) Number of single or 1st test procedures	(2) Number of duplicate or extra procedures	(3) Quality Control & other tests	(4) TOTAL TESTS for the year
Acidity, Titrateable	173	174		347
Added Water (Cryoscope)	9		20	29
Ash, Muffle or Wet	60	60		120
Brix Value	176	177	4	357
Crude Fiber	2	2	2	6
Fat Indirect	40	41		81
Fat (Roese-Gottlieb)	2,045	2,726	540	5,311
Fat (Soxhlet)	2,291	3,437	352	6,080
Gas (Orsat)	385	30	385	800
Leakage	105	105		210
Moisture (Oven Method)	2,061	2,062	366	4,489
Moisture (Toluene Method)	618	75	77	770
Nitrate or Nitrites	17	17	5	39
Phosphatase Activity	17	17	10	44
Phosphates	19	19		38
pH Value	522	100	522	1,144
Protein (Kjeldahl)	53	53	15	121
Protein Reducing Subst.	34	34	8	76
Salt (Total Chlorides)	626	627	132	1,385
Scorches Particle	3		1	4
Solids, Total (Dairy)	2,061	3,091	352	5,504
Thiobarbituric Acid (TBA)	49	50		99
TOTAL	11,366	12,897	2,791	27,054

Fats, Shortening and Edible Oils

Procedure or Test	(1)	(2)	(3)	(4)
Alpha Monoglycerides	76	76		152
Butter Analysis	14	14		28
Emulsion Stability	5	5		10
Free Fatty Acid	91	91	44	226
Melting Point	63	63		126
Moisture (Karl Fisher)	41	42		83
Moisture/Volatile	158	159		317
Peroxide Value	105	105		210
Smoke Point	36	36		72
Solid Fat Index	33	34		67
Stability, AOM	121	122	11	254
TOTAL	743	747	55	1,545

APPENDIX K (cont)

LAMC, FOOD ANALYSIS PROCEDURES AND TESTS FOR THE 12 MONTH PERIOD, 1 APRIL 1975 - 31 MARCH 1976

Special and Misc. Chemistry

Procedure or Test	(1) Number of single or 1st test procedures	(2) Number of duplicate or extra procedures	(3) Quality Control & other tests	(4) TOTAL TESTS for the year
Antibiotics	3	3		6
Heavy Metals	148	149	71	368
Histamines (TLC)	6	6	2	14
Meat Extenders (soy,cereal,whey)	8	8		16
Minerals	4	4		8
Pesticides	35	36	26	97
Ranicidity	5	5		10
Vitamins	4	4	1	9
Hypochlorite	5	5		10
TOTAL	218	220	100	538

Food Microbiology

Procedure or Test	(1)	(2)	(3)	(4)
Anaerobic Culture	537	697	137	1,371
Coliform or E. Coliform	6,862	10,384	1,091	18,337
Direct Smear or Stain	740	138		878
Headspace Gas	250			250
Microanalytical Examination	746	145		891
Streptococci or Staph	152	625	306	1,083
Salmonellae	354	1,460	708	2,522
SPC or Aerobic Count	6,541	10,838	891	18,270
Yeast and Mold Count	505	2,152	143	2,800
TOTAL	16,687	26,439	3,276	46,402

Recapitualation

Procedure or Test	(1)	(2)	(3)	(4)
General Food Chemistry	11,366	12,897	2,791	27,054
Shortening and Oils	743	747	55	1,545
Special & Misc., Chemistry	218	220	100	538
Food Microbiology	16,687	26,439	3,276	46,402
GRAND TOTAL	29,014	40,303	6,222	75,539

APPENDIX L

WRAMC, FOOD ANALYSIS PROCEDURES AND TESTS FOR THE 12 MONTH PERIOD, 1 APRIL 1975 - 31 MARCH 1976

General Food Chemistry Procedure or Test	(1) Number of single or 1st test procedures	(2) Number of duplicate or extra procedures	(3) Quality Control & other tests	(4) TOTAL TESTS for the year
Acidity, Titrateable	414	41		455
Ash, Muffle or Wet	20	20		40
Brix Value	6			6
Fat (Roese-Gottleib)	4,229	4,229	32	8,490
Fat (Soxhlet)	1,132	1,132	40	2,304
Gas (Orsat)	393		8	401
Moisture (Oven Method)	528	528	36	1,092
Moisture (Toluene Method)	216	216	6	438
Phosphatase Activity	5,043		2,440	7,483
pH Value	372	37	103	512
Protein (Kjeldahl)	145	145	32	322
Salt (Total Chlorides)	338	338	35	711
Solids, Total (Dairy)	2,486	2,486	26	4,998
TOTAL	15,322	9,172	2,758	27,252

Fats, Shortening, and Edible Oils

Procedure or Test	(1)	(2)	(3)	(4)
Alpha Monoglycerides	9	9	9	27
Color, Lovibond	46	15		61
Emulsion Stability	29	10		39
Free Fatty Acids	35	35		70
Iodine Value	5	5	2	12
Melting Point	46			46
Moisture/Volatile	72	72		144
Peroxide Value	118		20	138
Smoke Point	46			46
Solid Fat Index	86	86		172
Stability, AOM	63	63	10	136
TOTAL	555	295	41	891

Special & Misc. Chemistry

Procedure or Test	(1)	(2)	(3)	(4)
Antibiotics	343	2	294	639
Copper (Salad Dressing)	8	8	8	24
Heavy Metals	16	16	8	40
Meat Extenders (soy,cereal,whey)	44	44	28	116
Pesticides	33	33	33	99
Physical (wt. vol.)	332		30	362
Sugar, Total	10	10		20
Sulfur Dioxide	17	8		25
TOTAL	803	121	401	1,325

APPENDIX L (cont)

WRAMC, FOOD ANALYSIS PROCEDURES AND TESTS FOR THE 12 MONTH PERIOD, 1 APRIL 1975 - 31 MARCH 1976

Food Microbiology

Procedure or Test	(1) Number of single or 1st test procedures	(2) Number of duplicate or extra procedures	(3) Quality Control & other tests	(4) TOTAL TESTS for the year
Anaerobic Culture	362			362
Coliform or E. Coliform	7,042		618	7,660
Microanalytical Exam	258			258
Psychrophile	79			79
Streptococci or Staph	17			17
Salmonellae	691			691
SPC or Aerobic Count	5,657		1,546	7,203
Yeast and Mold Count	238		123	361
TOTAL	14,344		2,287	16,631

Recapitualation

Procedure or Test	(1)	(2)	(3)	(4)
General Food Chemistry	15,322	9,172	2,758	27,252
Shortening and Oils	555	295	41	891
Special & Misc. Chemistry	803	121	401	1,325
Food Microbiology	14,344		2,287	16,631
TOTAL	31,024	9,588	5,487	46,099

APPENDIX M

TOTAL COMBINED FOOD ANALYSIS PROCEDURES AND TESTS FOR CONUS BASED HSC VETERINARY LABORATORIES FOR THE PERIOD - 1 APRIL 1975 - 31 MARCH 1976

General Food Chemistry Procedure or Test	(1) Number of single or 1st test procedures	(2) Number of duplicate or extra procedures	(3) Quality Control & other tests	(4) TOTAL TESTS for the year
Acid Phosphatase	4		9	13
Acidity, Titrateable	3,109	415	60	3,584
Added Water, Cryoscope	21	10	42	73
Ash, Muffle or Wet	118	119		237
Brix Value	238	205	4	447
Copper (in cheese)	31	31	4	66
Crude Fiber	12	12	7	31
Fat (Roese-Gottleib)	16,114	13,720	2,040	31,874
Fat, Indirect	40	41		81
Fat (Soxhlet)	8,888	8,751	1,027	18,666
Gas (Orsat)	971	129	393	1,493
Leak Test	125	105		230
Moisture (Oven Method)	7,223	5,766	651	13,640
Moisture (Toulene Method)	993	367	93	1,453
Nitrate or Nitrites	72	40	51	163
Phosphatase Activity	9,495	247	2,998	12,740
Phosphates	19	19		38
pH Value	2,038	387	899	3,324
Protein (Kjeldahl)	849	847	367	2,063
Protein Coagulation	123	119		242
Protein Reducing Subst.	58	58	16	132
Salt (Total Chlorides)	4,959	2,193	661	7,813
Scorched Particle	71	30	1	102
Solids, Total (Dairy)	9,507	8,718	1,172	19,397
Solubility Index	38			38
Thiobarbituric Acid (TBA)	112	113	86	311
TOTAL	65,228	42,442	10,581	118,251

Fat, Shortenings and Edible Oils Procedure or Test	(1)	(2)	(3)	(4)
Alpha Monoglycerides	85	85	9	179
Butter Analysis	14	14		28
Color Lovibond	46	15		61
Emulsion Stability	34	15		49
Free Fatty Acids	271	245	72	588
Iodine Value	5	5	2	12
Melting Point	109	63		172
Moisture, (Karl Fisher)	41	42		83
Moisture, Volatile	230	231		461
Peroxide Value	366	165	57	588
Smoke Point	82	36		118
Solid Fat Index	119	120		239
Stability, AOM	184	185	21	390
TOTAL	1,586	1,221	161	2,968

APPENDIX M (cont)

TOTAL COMBINED FOOD ANALYSIS PROCEDURES AND TESTS FOR CONUS BASED HSC VETERINARY LABORATORIES FOR THE PERIOD - 1 APRIL 1975 / 31 MARCH 1976

Special & Misc. Chemistry Procedure or Test	(1) Number of single or 1st test procedures	(2) Number of duplicate or extra procedures	(3) Quality Control & other tests	(4) TOTAL TESTS for the year
Antibiotics	346	5	294	645
Bread (Solids)	146			146
Copper	8	8	8	24
Heavy Metals	479	196	85	760
Histamine (TLC)	6	6	2	14
Hypochlorite	5	5		10
Meat Extenders (soy,cereal,whey)	342	132	56	530
Minerals	22	4		26
Pesticides	93	81	59	233
Physical (wt.vol.)	507		30	537
Ranicidity	14	9	4	27
Sieve Test	35	4		39
Sugar, Total	10	10		20
Sulfur Dioxide	17	8		25
Vitamins	4	4	1	9
TOTAL	2,034	572	539	3,045

Food Microbiology

Procedure or Test	(1)	(2)	(3)	(4)
Anaerobic Culture	1,649	1,034	157	2,840
Coliform or E. Coliform	28,454	19,398	2,359	50,211
Direct Smear or Stain	1,142	188		1,330
Headspace	250			250
Microanalytical Exam	1,164	145		1,309
Psychrophile	79			79
Streptococci or Staph	672	695	306	1,673
Salmonellae	1,604	2,181	726	4,511
SPC or Aerobic Count	25,315	20,425	3,521	49,261
Yeast and Mold Count	2,165	3,347	470	5,982
TOTAL	62,494	47,413	7,539	117,446

Recapitualation

Procedure or Test	(1)	(2)	(3)	(4)
General Food Chemistry	65,228	42,442	10,581	118,251
Shortening and Oils	1,586	1,221	161	2,968
Special & Misc., Chemistry	2,034	572	539	3,145
Food Microbiology	62,494	47,413	7,539	117,446
GRAND TOTAL	131,342	91,648	18,820	241,810

APPENDIX N

FLOOR SPACE AND OPERATING COST DATA FOR HSC VETERINARY LABORATORIES FOR THE 12-MONTH PERIOD, 1 APRIL 1975 - 31 MARCH 1976

Direct Operating Costs

Cost Code	BAMC	DDEAMC	LAMC	ST LOUIS	WRAMC	TOTALS
Code 2100 Mission TDY	300	800	1,200		800	3,100
Code 2100 Conference TDY	700	400	800	700	200	2,800
Code 2300 Rentals		400				400
Code 2400 Printing					100	100
Code 2500 Contracts		500	800			1,300
Code 2600 Supplies	25,500	15,600	28,900	14,700	19,600	104,300
Code 3100 Cap Equip	5,300	300	4,100			9,700
Space Lease, GSA Bldg				45,500		
SUBTOTAL	31,800	18,000	35,800	60,900	20,700	167,200
Salaries						
Military Personnel	120,000	52,000	64,700	39,600	53,800	330,100
Civilian Personnel	91,200	100,400	139,000	163,000	92,100	585,700
Overtime			1,200			1,200
SUBTOTAL	211,200	152,400	204,900	202,600	145,900	917,000
TOTAL EXPENDITURES	243,000	170,400	240,700	263,500	166,600	1,084,200

Square Feet of Floor Space Occupied by HSC Veterinary Laboratories, May 1976

Functional Area	BAMC	DDEAMC	LAMC	ST LOUIS	WRAMC	TOTALS
Office, Admin	360	264	2,600	400	160	3,784
Food Chemistry	2,160	1,036	9,400	3,000	1,143	16,739
Food Microbiology	360	572	620	800	189	2,541
Clinical Diagnostic	180	363	100		184	827
Lab Animal Colony	1,080	858	1,000		707	3,645
Preparation/Wash	540	209	110	360	*	1,219
Shipping & Receiving	*	286	*	900	*	1,186
Storage/Supply	180		1,920	440		2,540
Net Utilizable	4,860	3,588	15,750	5,900	2,383	32.481
Hallways, Common Areas, Eng Space	720	1,085	840	400	470	3,515
GROSS SQUARE FEET	5,580	4,673	16,590	6,300	2,853	35,996

*CENTRAL AREA OR SPACE SHARED WITH OTHER LABORATORY SECTIONS.

APPENDIX O

DATA FROM OVERSEAS VETERINARY LABORATORIES (JAPAN, GERMANY, HAWAII) FOR THE 12 MONTH PERIOD, 1 APRIL 1975-31 MARCH 1976

Food Samples/Laboratory	USAML, Pacific	10th ML, Europe	USAML, Hawaii
Fresh & Dairy Products	2,218	3,029	440
Mfg & other Dairy Products		416	10
Fresh & Cured Meats	286	2,671	188
Rations & Canned Meats	37	617	9
Shortening & Fats		4	6
Sugar & Flour	14		
Cereals, Condiments		158	
Beverages	270		
Canned Foods	458		133
In Flight Meals			184
Water	635		
Miscellaneous	331	610	
TOTAL	4,249	7,505	970
Samples not tested damage/accident	128	599	
Quality Control Samples	225	240	24
Samples per week; High/Low	137/0	162/71	55/0
Samples per month; High/Low	506/173	648/284	122/68

APPENDIX O (cont)

USAML, Pacific Food Analysis Procedures Procedure or Test	(1) Number of single or 1st test procedures	(2) Number of duplicate or extra procedures	(3) Quality Control & other tests	(4) TOTAL TESTS for the year
Acidity, Titratable	351	351		702
Ash, Wet, or Muffle	12	12		24
Brix Value	98	99		197
Fat, Roese-Gottleib	1,395	1,940	198	3,533
Fat, Soxhlet	152	153	22	327
Moisture, Oven Method	200	200	22	422
pH Value	296			296
Protein, Kjeldahl	29	29		58
Salt, Total Chlorides	33			33
Solids, Total (Dairy)	1,150	1,615	198	2,963
Heavy Metals	3			3
Meat Extenders	3			3
Anaerobic Culture	590			590
Coliform or E. Coliform	3,294		489	3,783
Direct Smear or Stain	33			33
Salmonellae, Staph, Strep	1,500	1,559		3,059
SPC or Aerobic Count	3,148	3,148	489	6,785
Yeast and Mold Count	641			641
Water Coliform	618			618
Microanalytical Examination	590			590
Confirmatory Bacterials	750			750
TOTAL	14,886	9,106	1,418	25,410

10th ML, Europe Food Analysis Procedures	(1)	(2)	(3)	(4)
Acidity, Titratable	1,073	1,073	91	2,237
Added Water, Cryoscope	115	115	69	299
Fat, Gerber	1,479	1,479	160	3,118
Fat, Roese-Gottleib	749	749	36	1,534
Moisture, Oven Method	3,012	3,012	176	6,200
Phosphatase Activity	2,091	200	480	2,771
pH Value	284	284	99	667
Protein, Kjeldahl	673	673	75	1,421
Salt, Total Chlorides	111	111	24	246
Solids, Total (Dairy)	2,861	2,861	352	6,074
Antibiotics	84		84	168
Radioisotopes	84		84	168
Whey Protein Nitrogen	47	47	18	112
Food Microbiology	*	*	*	*
TOTAL	12,663	10,604	1,748	25,015

* DATA NOT RECEIVED, BUT ROUTINE FOOD MICROBIOLOGY TESTING WAS DONE ON ALL DAIRY AND OTHER FOOD PRODUCTS.

APPENDIX 0 (cont)

USAML, HAWAII Food Analysis Procedures Procedure or Test	(1) Number of single or 1st test procedures	(2) Number of duplicate or extra procedures	(3) Quality Control & other tests	(4) TOTAL TESTS for the year
Fat, Roese-Gottleib	163	163	12	338
Fat, Soxhlet	152	152	12	316
Moisture, Oven Method	166	166	12	344
Phosphatase Activity	110			110
pH Value	8			8
Protein, Kjeldahl	69	69	12	150
Solids, Total (Dairy)	79	79	12	170
Meat Extenders	69			69
Physical (wt. vol.)	130			130
Coliform or E. Coliform	1,015		150	1,165
Salmonellae	239			239
SPC or Aerobic Count	1,354		240	1,594
Yeast and Mold Count	88		10	98
TOTAL	3,642	629	460	4,731

Diagnostic Specimens	USAML, Pacific	10thML, Europe	USAML, Hawaii
Brain or Heads (Rabies)	22	214	NO LABORATORY ANIMAL OR VETERINARY DIAGNOSTIC SERVICES.
Urine (Animal)	2		
Blood or Serum (Animal)	1,634	4	
Urine (Human)		340	
Blood or Serum (Human)	42	145	
Autopsy	33		
Tissues	37		
Rabies, Serum Neutralization	37	75	
Parasites, all kinds	1,237		
HCG		127	
UCG or Pregnancy (Human)		348	
Sheep/Venipuncture		1,716	
TOTAL	3,044	2,969	

Laboratory Animals Used/Issued	USAML, Pacific	10thML, Europe	USAML, Hawaii
Mouse	14,010	6,000	
Guinea Pig	15	60	
Hamster	12		
Rabbit	11		
Chicken	22	10	
Gerbil	46		
Cat	3		
Rat		104	
Sheep (For Blood Only)		140	
Pigeon		1,050	
Goat		1	
TOTAL	14,119	7,365	

APPENDIX 0 (cont)

USAML, Pacific Food Analysis Procedures Procedure or Test	(1) Number of single or 1st test procedures	(2) Number of duplicate or extra procedures	(3) Quality Control & other tests	(4) TOTAL TESTS for the year
Acidity, Titratable	351	351		702
Ash, Wet, or Muffle	12	12		24
Brix Value	98	99		197
Fat, Roese-Gottleib	1,395	1,940	198	3,533
Fat, Soxhlet	152	153	22	327
Moisture, Oven Method	200	200	22	422
pH Value	296			296
Protein, Kjeldahl	29	29		58
Salt, Total Chlorides	33			33
Solids, Total (Dairy)	1,150	1,615	198	2,963
Heavy Metals	3			3
Meat Extenders	3			3
Anaerobic Culture	590			590
Coliform or E. Coliform	3,294		489	3,783
Direct Smear or Stain	33			33
Salmonellae, Staph, Strep	1,500	1,559		3,059
SPC or Aerobic Count	3,148	3,148	489	6,785
Yeast and Mold Count	641			641
Water Coliform	618			618
Microanalytical Examination	590			590
Confirmatory Bacterials	750			750
TOTAL	14,886	9,106	1,418	25,410

10th ML, Europe Food Analysis Procedures	(1)	(2)	(3)	(4)
Acidity, Titratable	1,073	1,073	91	2,237
Added Water, Cryoscope	115	115	69	299
Fat, Gerber	1,479	1,479	160	3,118
Fat, Roese-Gottleib	749	749	36	1,534
Moisture, Oven Method	3,012	3,012	176	6,200
Phosphatase Activity	2,091	200	480	2,771
pH Value	284	284	99	667
Protein, Kjeldahl	673	673	75	1,421
Salt, Total Chlorides	111	111	24	246
Solids, Total (Dairy)	2,861	2,861	352	6,074
Antibiotics	84		84	168
Radioisotopes	84		84	168
Whey Protein Nitrogen	47	47	18	112
Food Microbiology	*	*	*	*
TOTAL	12,663	10,604	1,748	25,015

* DATA NOT RECEIVED, BUT ROUTINE FOOD MICROBIOLOGY TESTING WAS DONE ON ALL DAIRY AND OTHER FOOD PRODUCTS.

APPENDIX O (cont)

Personnel Data	USAML, Pacific	10thML, Europe	USAML, Hawaii
Officers, authorized	1	2	1*
Enlisted, authorized	3	10	1
Civilian, authorized	9	5	1
Total authorized	13	17	3
Currently assigned	10	15	3
Manyear for 12 months	12.4	11.9	1.2

* ASSIGNED FOR PART-TIME WORK IN THE VETERINARY LABORATORY.

Manyear Utilized In Functional Areas			
Management and Administration	2.4	1.8	.6
Food Chemistry	4.0	2.5	.5
Food Microbiology	1.5	2.5	.1
Clinical and Diagnostic	1.0	2.0	
Laboratory Animal Colony	3.5	2.0	
Blood Processing		0.1	
Wash/Preparation		1.0	
TOTAL	12.4	11.9	1.2

Floor Space In Functional Areas (sq. ft.)			
Management and Administration	472	440	120
Food Chemistry	696	630	540
Food Microbiology	408	500	540
Clinical and Diagnostic	922	529	
Laboratory Animal Colony	5,342	346	
TOTAL*	7,840	2,445	1,200

* STORAGE, COMMON SPACE, OUTSIDE ANIMAL AREAS AND ENGINEER'S SPACE NOT INCLUDED.

Direct Operating Costs:	USAML, Pacific	10thML, Europe	USAML, Hawaii
Code 2100 Mission TDY		1,200	
Code 2100 Conference TDY	1,800	200	
Code 2300 Rental			
Code 2600 Supplies	14,200	60,000	3,000
Code 3100 Capital Equipment		4,500	
SUBTOTAL	16,000	65,900	3,000
Salaries/Wages			
Military	42,400	120,000	9,700
Civilian	100,600	30,000	17,500
Overtime	400		
SUBTOTAL	143,400	150,000	27,200
TOTAL EXPENDITURES	159,400	215,900	30,200

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